An Empirical Study of Multisection Virtual 3D Healthcare Learning Environments

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An Empirical Study of Multisection Virtual 3D Healthcare Learning Environments

Investigation into the Effect of Multisection Incorporation on the Usability of Online 3D Virtual Healthcare Learning Environments and the Production of Empirically Derived Guidelines for Designing the Learning Environments.

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بسم الله الرحمن الرحيم

In the Name of Allah, the Most Compassionate, the Most Merciful

DEDICATION

This thesis is dedicated to my husband the partner in this world and hereafter, my parent the shoulder to cry on and the four pearls of my soul, Azzam, Aziz , Salam and newcomer for their constant love, encouragement and patience.

Nik Siti Hanifah Nik Ahmad

ABSTRACT

The thesis investigated the use of combination of sections using learning steps in the development of courseware presentation in the 3D Virtual Worlds platform. The technical objective of the study is to present the design of multisection strategy in developing healthcare course in 3D Virtual World online environment. The main aim of this study is to know the effects of multisection [objective, tutorial (with or without video), quiz and test] sections incorporation in an online 3D Virtual World towards the usability. The empirical research described in this thesis comprised three experimental phases. In the first phase, an initial experiment was carried out with 21 users to explore the usability and learning performance of courseware created using 3D the Virtual World platform of Second Life. The second experiment phase involved an experiment conducted with 30 users to investigate their perception, satisfaction and performance of the role of each main section involved in Virtual World courseware. In the third phase, a total of 30 users experimentally examined a unique approach to the use of video segment added in the Tutorial section of the OTQT framework. The overall obtained results demonstrated the usefulness of the tested multisection to enhance the development of healthcare course in an online learning of 3D Virtual World program. These results in three experiments provided a set of unique and empirically derived guidelines for the design and the use of three multisection frameworks to generate more usable courseware in the 3D Virtual Worlds of an online learning interface. For example, when designing avatars as animated virtual lecturers in e-learning interfaces, specific facial expression and body gestures should be incorporated due to its positive influence in enhancing learners' attitude towards the learning process.

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RELATED PUBLICATIONS AND PAPERS

Some parts of the work presented in this thesis have been submitted and published in the following publication:

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N. S. H. Nik Ahmad, T.R.Wan and P.Jiang. Health course module in Virtual World. *Procedia Computer Science*, Volume 3, Pages 1454-1463, (2011).

N. S. H. Nik Ahmad, T.R.Wan and P.Jiang. Immersive environment courseware evaluation. *Procedia - Social and Behavioural Sciences*, Volume 15, 2011, Pages 1667-1676, (2010).

N. S. H. Nik Ahmad, T. R. Wan and P. Jiang. Learning through Virtual Worlds: Comparative between UK and Malaysia . *Procedia - Social and Behavioural Sciences*, Volume 9, 2011, Pages 11-20, (2010).

N. S. H. Nik Ahmad, T. R. Wan and P. Jiang. Teaching Complementary and Alternative Medicine through 3D Virtual World. *The 7th World Conference On Muslim Education (World-COME2009* , 006 (2009).

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ABBREVIATIONS

2DC	Two dimensional Courseware
3D	Three dimensional
ADDIE	Analysis, Design, Development, Implementation, Evaluation
ARCS	Attention, Relevance, Confidence and Satisfaction
CAA	Computer- Assisted Assessment
CAD	Computer Aided Design
CAM	Complementary and Alternative Medicine
CD-ROM	Compact Disc Read-Only Memory
GIS	Geographic Information System
GPS	Global Positioning System
HCI	Human-Computer Interaction
ICT	Information Communication Technology
ISD	Instructional Design System
IVIMEDS	International Virtual Medical School
JISC	Joint Information Systems Committee
LMS	Learning Management System
MOODLE	Course Management System
MUVE	Multiuser Virtual Environments
OTQ	Objective, Tutorial and Quiz
OTQT	Objective, Tutorial, Quiz and Test
OTVQT	Objective, Tutorial with video, Quiz and Test
PDA	Personal Digital Assistant
SLOODLE	Simulation Linked Object Oriented Dynamic Learning

	Environment
UK	United Kingdom
UNESCO	United Nations Educational, Scientific and Cultural Organizations
UNITAR	University of Tunku Abdul Rahman
USM	Malaysia University of Science
VE	Virtual Environment
VLE	Virtual Learning Environment
VWC	Virtual World Courseware I
VWC2	Virtual World Courseware II
VWC3	Virtual World Courseware III

CHAPTER 1

Introduction

1.1 Introduction

The explosion of the number of technology tools for the last decade has enabled medical education in exploring web-based education, virtual reality and high-fidelity patient simulation. (Vozenilek et al, 2004). There is an exponential growth of internet health seeking information which uniformly high (Lacroix et al., 1994). With the increasing telecommunication technologies such as broadband and mobile access, Virtual Worlds are expected to become part of everyday routine (Book, 2006). It will become a centre for trade, commerce and business. Even though the Virtual Worlds are still new especially in education, but it is believed to become part of the everyday future like the Internet used to be in 1980's before. Healthcare and pharmaceutical industries used to bring everyday innovations that can mean the difference between life and death of the patients. While intervention strategies could be done to enhance promotion of health and safety, instructional design could be used to give solutions. Mead et al (1999) suggested the application of cognitive theory to training and design solutions for age related computer use. Feldman and Case (1999) had proved that instructional design materials can improve health and safety through self-learning. 3D Virtual Worlds online environment interfaces offers great potential for medical and health education (Boulos, 2007). The inclusion of the course syllabus and lesson plan such in traditional classroom need to be manipulated and instructed in such a ways suitable with technology systems and tools development to enhance learning delivery and performance (Gagne,1985, and Sun, 2005).

The reviewed literature demonstrated the importance of incorporating of goal setting (objective), progress monitoring (test), self-assessment (quiz) and motivation (interesting tutorial) for courseware design (Sun, 2005). In this 3D Virtual World virtual online environment interface research, we divide it into sections that we called multisection with combining objectives, tutorial, quiz and test sections of presenting healthcare course especially in women's health (for trial) and cupping treatment (second and third experiment). The reviewed literature also showed that the benefits of incorporating objective (Kumar, 2008) interactive tutorial (Boulos, 2007), quiz (self-assessment- Kibble-2007) and test (performance monitoring- Broeren, 2007) sections or parts in 3D Virtual Worlds online learning environment .However, the need for additional research to develop courseware for learning new skills by integrating multisection (objective, tutorial (with or without video segment), quiz and test sections) in 3D Virtual Worlds online learning environment is still highlighted.

This thesis investigates the use of developing courseware with multisection (objective, tutorial (with or without video segment), quiz and test section) in teaching healthcare skills specifically in Women Health and Cupping Treatment in 3D Virtual Worlds online learning environment interfaces. The experimental work undertaken within this investigation is aimed at exploring the influence of objective, tutorial, quiz and test section alongside avatars, simulation and 3D health objects on the usability and learning performance in online learning systems. The main question is whether the development of this courseware with the inclusion of multisection (objective, tutorial (with or without video segment), quiz and test section) is significant when incorporated in 3D Virtual Worlds online learning environment interfaces. The second question is related to the contribution of each of these sections (objective, tutorial (with or without video segment), quiz and test section) with the expected improvement. Finally, does it make a difference between with or without a video segment cooperated in the tutorial section on courseware development in 3D Virtual Worlds online learning environment interfaces? The following sections explain the aims and objectives of this thesis, the overall hypothesis and the method used to fulfil the aims. The chapter, finally, presents the research contribution and outlines its structure.

1.2 Aims and Main Objectives

As overall, this research aims to investigate the effect of the multisection (objective, tutorial (with or without video segment), quiz and test sections) incorporation towards the usability and learning performance of 3D Virtual World learning environment in online learning interfaces and to produce guidelines for the framework design and implementation of health care (specifically in women and cupping treatment) course presentation. Below, is the list of specific objectives according to experiment done in this research:

First objective: To get the overall usability of healthcare course development in the 3D Virtual Worlds online learning environment in terms of positive perception, satisfaction and user performance. The first experiment act as formative research which aims to gather information about the usability of the main sections (OTQ) of 3D Virtual World Health Care learning environment in online learning interfaces. It also aims to put together instructional designs that are suitable to be used for further development in an online 3D Virtual World Healthcare learning environments.

Second objective: To know the usability and the role of multisection (objective, tutorial (without video segment), quiz and test sections). The second experiment aims to investigate the usability and the role of each section of OTQ and addition of Test Section and enhancement of 3D health objects in online 3D Virtual World online learning environments. Thus, this experimental research consists of Objective, Tutorial, Quiz and Test sections of OTQT framework which investigated the usability and the role of every section and compared with already familiar 2-dimensional (flash) learning interfaces in order to evaluate its implications on the user learning performance, perception (in terms of ease of use, aesthetic, efficacy, presence) and satisfaction of online learning interfaces.

Third objective: To know the usability of additional tutorial section with video segment (OTVQT) in 3D Virtual Worlds online learning environments .This could confirm OTQT usability and enhance problem of text readability in the second experiment. The third experiment aims to investigate the usability of mini segment incorporation of video presentation in the Tutorial Section (OTVQT) of teaching Cupping Treatment in 3D Virtual Worlds online learning environments.

1.3 Overall Hypothesis

The overall hypothesis tested in this research was formulated as follows:

"The designs of healthcare course module (specifically in cupping treatment) which contains four main sections of Objective, Tutorial (with and without video segment), Quiz and Test produce a significant effect to the overall usability (user perception, satisfaction, and learning performance) of 3D Virtual World online learning environment interfaces . "

The pilot study of overall usability was tested by health students at USM, Malaysia in September, 2008 (Chapter 3) while the role of each (objective, tutorial, quiz and test) section (Chapter 4) and video segment (Chapter 5) were tested by volunteers at Bradford University. As a whole, the thesis suggests a set of derived guidelines for the design of more usable courseware interfaces in the 3D Virtual World that could offer better learning for users either in health education or other subject as well.

1.4 Scope of the Research

The scope of the research is to present the design framework of the healthcare (specifically in women health and alternative medicine) course in an online 3D Virtual World environment. The sample of short lessons of the first experiment was about episiotomy techniques and introduction of dementia while on the second and third experiments was about cupping treatment. The reasons of lesson chosen (cupping treatment) were, to make sure the users experience become zero knowledge with the topic since it was rare healthcare knowledge and shorten the research spent on techniques review since the researcher was the Cupping Method Expert herself. The cupping treatment is an ancient branch form of alternative medicine which used suction on the skin to mobilizes blood flow in produce healing. The pilot study has been done at Malaysia University of Science (USM), Kota Bharu, Kelantan, Malaysia while further experiments (second and third) were done by volunteers at Bradford University, UK. 21 health students have been chosen as a participant with the episiotomy and dementia lesson modules on an initial experiment while 60 more students (30 each) on Cupping Treatment lesson on second and third experiments.

1.5 Research Methods

The method used to carry out this research (usability study) included a literature survey and three experimental studies. The data collection process of experimental study was based on experimental tests and questionnaires. Experimental qualitative and quantitative test helped in testing user's learning performance while the data related to effectiveness [user perception (ease of use, efficacy, aesthetic, and presence) and satisfaction] was obtained from their responses to questionnaires.

There were three experiments involved in completing the study. The first experiment (Causes of Dementia and Episiotomy Techniques) was implemented at the Health School of Malaysia Science of University while the second and third experiments of alternative medicine (Cupping Treatment) were implemented at Bradford University.

Upon completion of each experiment, the obtained results were analyzed by using qualitative average ranking, and *within testing* analysis. Chi-square, Mann-Whitney and t-test were used to manipulate the results with $\alpha = 0.05$ and p-value less than 0.05. The first experiment used 27 users which is more than enough for *pilot study testing*. In second and third experiment, 30 users were involved in each of the experiment. Finally, main conclusions were drawn and empirical guidelines for the design and implementations of health or Cupping Treatment courseware development in an online 3D Virtual World environment learning interface were derived. The activities involved in this research method are illustrated in Figure 1.1 and described in the following subsections.

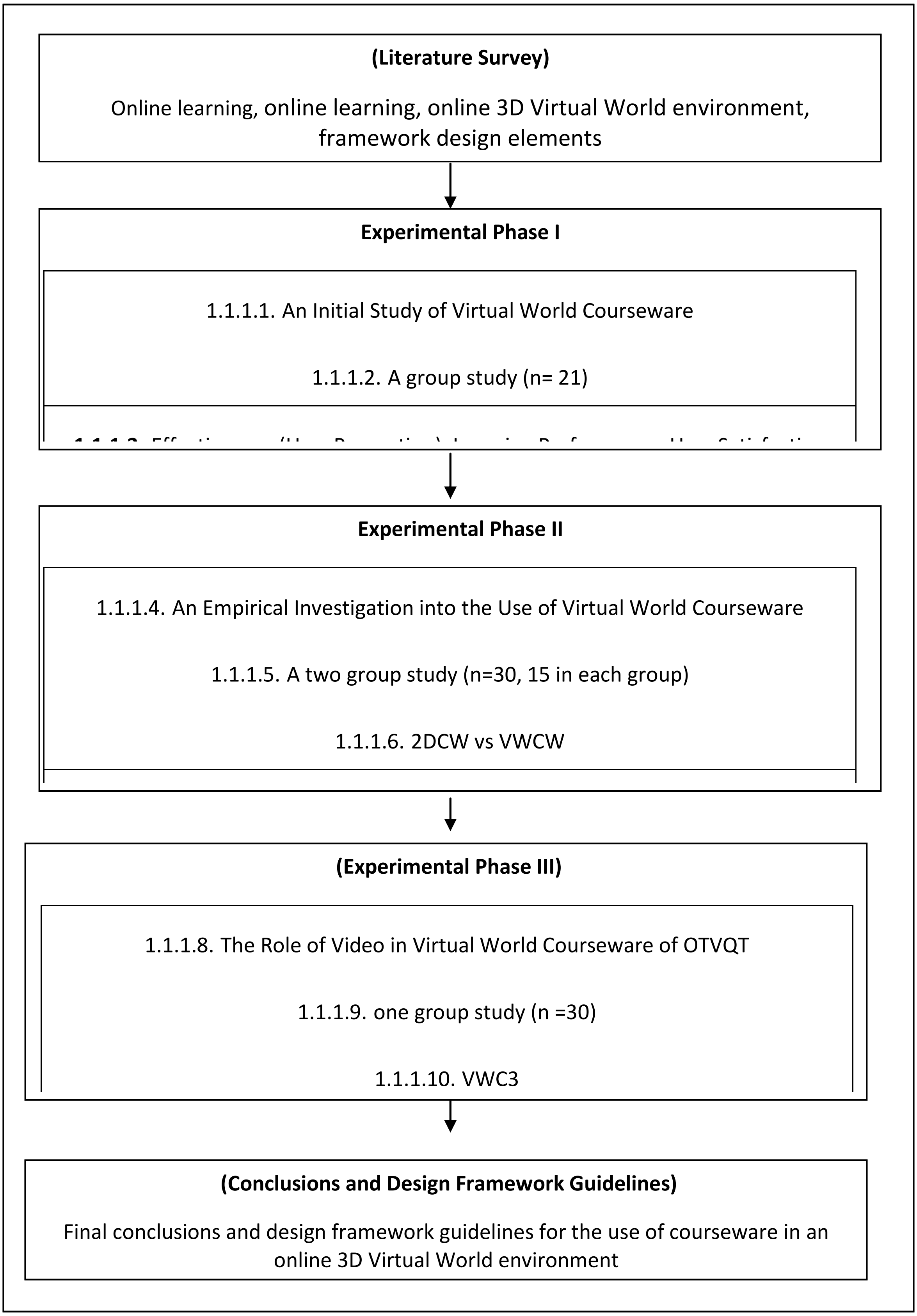


Figure 1.1: Flowchart of experimental phases undertaken in the study.

Literature Survey: The first step in this research was to review several relevant topics in the literature such as online learning, online 3D Virtual World environment and framework design elements (objective, tutorial, quiz, test and video). This review provided insights into the underlying background of online learning , health education definitions , instructional principles, trends and growth of online learning. The important of using multisections and video segment in an online 3D Virtual World (Metaverse/ MUVE) courseware environment learning interfaces was also discussed.

First Experiment: This experiment represented as initial investigation summative (learning performance) and formative research (usability) of the courseware development in an online 3D Virtual World environment of OTQ framework. This experiment was carried out to investigate the usability of the Virtual World courseware in online 3D Virtual World environment of Second Life platform and how it can be enhanced instructional and technically in further development of second and third experiment. Two lesson independent courseware prototypes in the Virtual World of Second Life platform were developed and presented. A group of 21 users (n=21) was involved to perform learning through the development courseware. The first health lesson module was about Episiotomy training and the second health lesson module is about the Causes of Dementia. Both health lessons were presented and included the same three sections of objective, tutorial and quiz in an online 3D Virtual World environment. The result of this experiment formed the basis to design and conduct the second experimental study in this research. On overall, the first experiment was designed to confirm findings of the literature survey and to carry out an initial evaluation to obtain an overall impression and gather suggestions for further development of a health courseware created in an online 3D Virtual World environment learning interfaces.

Second Experiment: This experiment was carried out to investigate the usability and the role of the OTQT framework of an online 3D Virtual World environment courseware learning interface and implement the suggestion of Test Section addition as enhancements from the basic framework (OTQ) in the first experiment. The aim of this experiment was to evaluate the effectiveness aspects of user perception (ease of use, aesthetic, efficacy, and presence), satisfaction and learning performance of two different online courseware learning interface in the presentation of Cupping Treatment lesson module. The first interface used two-dimensional of the flash platform while the second interface used online 3D Virtual World environment of Second Life platform. A total of 30 users (15 each group) was assigned to test the effectiveness, user satisfaction and learning performance of VWC2 by going through four sections of Cupping Treatment lesson module in the developed courseware.

Third Experiment: The results obtained from the second experiment highlighted the importance and the role of VWC2 framework (OTQT) design during the presentation of the courseware in the Virtual World environment. As an extension of the VWC2 interface used in the second experiment, the experimental online learning interface tested in the third experiment of the fifth chapter incorporated video (audio-visual) segment in the Tutorial Section of courseware and referred as Video Virtual World Courseware (VWC3). A total of 30 users were assigned to test the user perception (effectiveness), satisfaction and learning performance of the added Video Segment in the Tutorial Section of an online 3D Virtual World environment courseware.

Conclusions and Guidelines: In the final step of this research, the obtained results from three experimental studies were discussed as a whole to draw final conclusions and derived a design framework in implementing health or Cupping Treatment courseware development design of an online 3D Virtual World learning interface environment.

1.6 Thesis Contribution

The research reported in the thesis contributes to the literature in 3D Virtual Worlds online learning environment courseware design and healthcare education. The previous research had shown the prospect of 3D Virtual World in teaching and learning health care. Health care education which more to skills training, can easily and safely presented online with the existence of 3D Virtual World platform (Boulos, 2007). However, the existence of 3D Virtual World still lack of systematic instruction and guidelines which caused boring and low focus as educational platform. Therefore, the courseware which contains structured instructional design can be introduced to be applied in developing healthcare courses in 3D Virtual World. The multisection containing objective, tutorial (with and without video), quiz and test section was suggested in developing the healthcare course in 3D Virtual Worlds online learning environment interfaces.

As a whole, the thesis presents structured approach of incorporating four sections (objective, tutorial, quiz, and test) and one segment (video sessions in Tutorial Section) to present health and alternative medicine learning information in an online 3D Virtual World environment learning interfaces. A set of three experimental studies was conducted to evaluate combinations of four main sections (objective, tutorial, quiz and test) and one segment (Video) when incorporated in an online 3D Virtual World environment courseware learning interfaces.

The obtained results demonstrated that the use of this framework (four main sections and one segment) could benefit in enhancing the usability in addition to enabling users to attain better learning performance. Therefore, the thesis contributes to an online learning by providing systematic sections to enhance usability and learner performance of 3D Virtual World learning environment. These combinations include: Objective Section, Tutorial Section, Quiz Section and Test Section in an online 3D Virtual World courseware learning environment interface.

The thesis also investigates users' evaluation of Video Segment in Tutorial Section and suggests the adoption due to its higher positive influences on the usability of online learning interfaces. Additionally, video segment incorporation in Tutorial Section is proposed to support the role of OTQT in 3D Virtual Worlds online learning environment courseware and enhance its usability due to text readability which commented on second experiment. Finally, the thesis suggests a set of empirically derived guidelines for the framework design of a 3D Virtual World environment courseware online learning interfaces that believed to offer safety practice for healthcare learning, lower cost than real simulator and easy to modify for different learners.

1.7 Thesis Outline

This thesis is structured in seven chapters and a number of appendices. The following subsections describe these chapters and appendices.

Chapter 1: Introduction – This chapter describes an overall introduction to the thesis. The chapter briefly presents the research work carried out in term of aims, objective and method followed in this thesis. It also outlined the thesis structure and its contribution to the research area of courseware development in an online 3D Virtual World environment learning interfaces.

Chapter 2 and 3: Literature Review- This chapter reviews previous work in relation to online 3D Virtual World courseware learning interfaces and divided into three main sections; online learning and health education, courseware and multimedia presentation, and courseware in three- dimensional online learning interfaces of Virtual World environment with different section design frameworks. The first section provides background information about online learning and health education (health, medicine and alternative medicine education) as definitions, advantages and limitations, underlying pedagogical principles, online learning environments and technologies, and learning styles. Within the courseware and multimedia presentation section, the chapter provides the basic concepts of courseware and multimedia presentation, courseware usability evaluation and reviews several usability studies that highlighted the importance of presence and instructional design in the computer and online learning applications. In the last section, design issues and relevant research into the use of courseware in three-dimensional online learning interfaces of the Virtual World (Metaverse/ MUVE and Second Life) is discussed.

Chapter 4: First Experiment- The usability study of an online 3D Virtual World environment courseware (VWC) with OTQ framework. This chapter reports an initial experiment performed to investigate the usability and learning performance of courseware in a Virtual World (VWC). This experiment was carried out to investigate the usability of the Virtual World courseware (VWC) with the OTQ framework in an online 3D environment of Second Life platform and how it can be enhanced instruction and technically in further development of second and third experiment. This first phase of Virtual World courseware contains 3 segments of objective, tutorial and quiz of OQT framework.

Chapter 5: Second Experiment- An Empirical-Investigation of the Use and the Role of OTQT Framework in an online 3D Virtual World Courseware (VWC2). This chapter reports the experiment performed to investigate the usability and the role of the OTQT framework in an online 3D Virtual World environment courseware (VWC2) interfaces. This framework contains four segments which include objective, tutorial, quiz and test section of OTQT. This investigation was carried out empirically by assigning two independent groups of users to test two different versions of the experimental online learning platform: 2-dimensional/ flash (2DC) and Virtual World (VWC2) courseware. The obtained results were analyzed and discussed in the light of formulating hypothesis.

Chapter 6: Third Experiment- **The usability study of video (audio-visual) segment incorporation in Tutorial Section (OTQTV) of Virtual World Courseware (VWC3)**. The sixth chapter evaluates the influence of video (audio-visual) segment incorporation in the Tutorial Section of 3D Virtual World environment courseware. The platform template of Video (audio-visual) Virtual World courseware (VWC3) was developed and experimented by participants to value its performance and usability. The test results and questionnaire answers from the third (video) experiment was evaluated to investigate the usability of video (audio-visual) segment in the Tutorial Section of a courseware.

Chapter 7: Final Conclusions and Future Works- The final chapter describes the summary of the experiments studies undertaken in this research, briefs the main conclusion and limitations drawn from the obtained results and proposes a set of guidelines that could be utilized in the design of a courseware in an online 3D Virtual World environment learning interfaces to enhance its usability not only in health and alternative medicine but for all other educational subjects as well.

Appendices A: First Experiment_– presents the courseware in the Virtual World template of Episiotomy (Appendix A1) and Causes of Dementia (Appendix A2). It also provides the Episiotomy lesson (Appendix A3) and Causes of Dementia lesson (Appendix A4) that used in Virtual World courseware platform in the initial experiment. Quiz questions used in the Episiotomy (Appendix A5) and Causes of Dementia (Appendix A6) was provided. In the last part, the questionnaire used

(Appendix A7) and raw data computed (Appendix A8) during the first or initial experiment in Chapter 4 are shown.

Appendices B: Second Experiment- presents the courseware in 2D (flash) template (Appendix B1) and Virtual World template (Appendix B2). It also provides a cupping treatment lesson module that's being used in both tutorial platforms (Appendix B3), quizzes content and test questions. The questionnaire (Appendix B4) used to gain users' views about the two platforms was provided. In the last part, raw data of users' answers to the experimental part of the questionnaire are shown (Appendix B5).

Appendices C: Third Experiment - presents the questionnaire given to users of the third experiment described in Chapter 6 (Appendix C1) and template of video (audio-visual) technology part of the tutorial Virtual World courseware (Appendix C2). It also presents the raw data for users' views (Appendix C3).

CHAPTER 2

Literature Review: Developing Courseware in 3D Virtual World Online Environment for Teaching Healthcare

2.1 Introduction

This chapter reviews and analyses the theoretical and practical research work in relation to the research carried out within this thesis. More specifically, it comprises 4 main sections; online learning, health education, multisection (derived from several sections of objective, tutorial, quiz and test- Gagne's 9 instructional design in multimedia presentation and Sun, 2007)] and usability evaluation. The first section presents introductory information about online learning definitions, developments, benefits and challenges. The second section deals with the insights of health and alternative medicine education and the development and motivation of a healthcare self-directed learning in a 3D Virtual Worlds online environment. The third section informs about basic concepts of multisection which comprised of an objective, tutorial, a quiz, a test section and a video segment. The last section, however, focuses on the evaluation of a courseware in online learning interfaces which highlights the usability and learning enhancement due to the utilization of a courseware in a 3D Virtual World environment of the online learning interfaces. The criteria involve; ease of use, aesthetics, efficacy and presence elements which may affect the usability of a Healthcare course design in online 3D Virtual World environment learning interfaces.

2.2 Online Learning

2.2.1 Online Learning Introduction

Online learning or e-learning is described as the ability to electronically transfer, manage, support and supervise learning and its materials (Govindasamy 2002; Imamoglu, 2007). Meanwhile, Holmberg (1980) has described online or distance learning as "physical separation of student and instruction during the education delivery and focuses on independent and self-directed learning". Harasim, et.al (1997) has defined that online learning is a learning network which regroups of people who come to learn together, at the time, place and place that suits them. Khairuddin (2002) describes online or distance or virtual learning as learning from distance with or without an instructor across space and time. Another definition of online learning or virtual learning or self-directed learning or flexible learning is defined by Knowles as: (Abu Daud, Daing Zaidah and Azizan, 1999).

> *In its broadcast meaning self-directed learning describes a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes.*

Despite online or distance learning widely spreading with acceptance by many colleges and global universities, academic research has only focused primarily on curriculum content and instructional technology. Low (2000) in his study has stressed on the need of the research on the practical insights of online or distance learning, such as the best way for universities to manage the programs, competencies to market distance learning programs, collaborative relationships with local colleges who act as intermediaries and strategic factors.

Distance learning is not alternative learning anymore, it has become a necessity in almost each university especially in developing countries. According to Lifelong Learning Trends in 1998, a publication of the University Continuing Education Association, between 1970 and 1997, the number of part-time student enrollment in American colleges and universities more than doubled, growing from just under 3 million to an estimated 6.2 million. Part-time students are defined as those who take less than 75 percent of what a given institution considers full-time credit load (Cevero, 2000).

Breivik's (1999) study has shown that the educational reform report of the 1980s seems to offer some windows of opportunity for advancing the value of academic library resources and personnel as important tools for improving the learning process. Educational reform existing today is driven by demands from business and legislators for graduates who are lifelong learners.

Presently, with the development of sophisticated information technologies, the future of educational institutions depends on their capability to adapt to the new information society and meet the needs of an ever more demanding professional market. In the academic world, a strong message was conveyed to the higher education institutions to fully exploit the potential of ICT. This is to improve institutional efficiency and effectiveness (Dearing, 1997). Concerning the same matter, Hazemi et .al (1998) argued that for the development of a 'digital institutional education', an information strategy, which concerns the information management requirement as well as the information technology infrastructure, would be required. Meanwhile, the studies by Dillon and Gunawardena (1995) and

Leidner and Javenpaa (1993) suggest that there are three variables affecting the effectiveness of online delivery. They are the technology, instructor characteristics, and student characteristics.

Zaidah (2002) in her study has related the students' readiness and attitude towards online learning with some variables such as demographic background, and computer knowledge and skills. This new type of education provides lots of interaction with email, computer conferencing, online tutorials and forums. Interactions are done both asynchronously and synchronously. Course materials are also provided online. However face-to-face meetings are also conducted to support online teaching. Since online or distance learning will be the future of education and widely implemented one day, it is important for the educational institutions to improve their facilities, techniques and resources for the students' understanding, knowledge enhancement and study skill expertise.

2.2.2 Development of Online Learning (UK vs Malaysia)

Educational technology develops with the development of information technology such as television, motion pictures, audiotapes and disc, textbooks, blackboards, internet and so on (Gentry, 1995). In these days, online learning is a recent phenomenon at government and private educational institutions. Now, almost each and every university in the world provides distance learning programs. The forms of online learning can be the adjunct mode, the mixed mode, and the totally online mode (Harasim, 1997). Most universities use online learning in the adjunct mode, where the network learning is used to supplement the regular campus instruction. (Zaidah, 2002).

Online learning provides interactions through email, computer conferencing, online tutorials and forums. Interactions can be done both asynchronously and synchronously. Course materials can also provided online. However face-to-face meetings are also conducted to support online teaching (Zaidah, 2002). E-learning has been deployed by almost every big educational institution in the UK, and about 95 % of them have used at least one of virtual learning environment in their teaching and learning programs (Rhona, 2006). E-learning has proven to reduce management costs, provide faster training delivery, improved access and tracking employer development (Bearnish, 2002).

In Malaysia, online learning is a recent phenomenon at government educational institutions. In this kind of environment, students are not learning in a place, as we usually understand in the ordinary sense but in a shared “space” usually called the “cyberspace”. The learning network ‘classroom’ is anywhere as long as students have a computer, a modem, a telephone line, satellite dish, or radio link (Daing Zaidah, 2002). Due to the limited number of places available at universities, less than half of all Malaysian eligible applicants are able to secure places each year. This means many of them have to choose the alternative training or study abroad, even though higher schools in Malaysia have been offering distance or online learning programs for more than 20 years.

In 1997, over one-third of all under-graduate level is part-time. Between 1970 and 1997, part-time enrollments increased by 125 percent, compared with 44 percent of full-time enrollment. Now, the trend is catching up in Malaysia (Zaidah, 2002). The rapid advancement of computing and telecommunication technologies has enabled universities to move from the traditional mode to alternative modes of learning, namely the virtual university to cater for adult students who wish to study part-time. But then, the total enrollment in tertiary education represents only around 8 per cent of the group age from 20 to 24 years old. Since online or distance learning had been introduced into the university system, it comes in three forms. They are the adjunct mode, the mixed mode, and the totally online mode (Harasim, 1997) Most universities in Malaysia use online learning in the adjunct mode, where the network learning is used to supplement the regular campus instruction. (Zaidah, 2002). Examples of this are Universiti Tun Abdul Razak (UNITAR), Multimedia University (MMU) and Universiti Teknologi MARA (UiTM).

Online learning provides the mainframe of interactions through email, computer conferencing, online tutorials and forums. Course materials can also be provided online. However face-to-face meetings are also conducted to support online teaching (Zaidah, 2002). According to Daing Zaidah et al (2002) at Annual Conference of Asian Association of Open Universities, New Delhi, they had made several statements from the survey that's being done at UNITAR. Firstly, maturity is a critical factor in being more ready for online learning. The result showed that working students are more ready than non-working students towards online learning. Secondly, owning a computer is important for students to have more favourable attitudes towards online learning. Therefore, many of the virtual students own PCs with Internet access. Thirdly, the knowledge and skills in selected computer applications are significantly related to level of readiness and level of attitude towards online learning. Computing and media students most likely the one whom more ready to learn online. Meanwhile, students with higher level of computer knowledge and skills also having more positive attitudes towards online learning.

2.2.3 The Future of Online Learning Applications

The online or distance learning approach is one of the approaches towards implementing changes and recognizing that academic objectives should drive innovations instead of only the technology. It will generate more benefits to education and business. By developing a general methodology for the planning, application and evaluation of teaching and learning techniques and tools, both education and business can earn the advantages (Low, 2000; Katz and Yablon, 2003; Lakatos et.al, 2003) Furthermore, it is a time that universities should try to provide flexibility and adaptability in learning situations and technologies (Butler, 2001). In online learning, computers are used as a basic tool and additional knowledge enhancement tool are used for problem solving, modeling, searching and discovery with the innovative tool as software development (Khairuddin, 2002).

Online or distance learning delivers accountability, accessibility and opportunity. It allows people and organizations to keep up with changes in the global economy that occur at Internet time (Dwyer, 2001). Online or distance learning is a fundamental part of our new economy both in the educational and business world.

With the rapid adoption of new information and new programs , online learning can improve the education quality, gathering information from a greater variety of sources, and increased access for lifelong learners (Johnson, 1994). Therefore, online learning would be able to prduce greater productivity, increased profitability, and enhanced employee loyalty (Robinson, 2002).

Use of the Internet offers great opportunities to provide education which is available to many and which is adaptable and flexible. This is being realized by learning institutions, also by corporate organizations seeking effective and cost-effective management development (Sanderlands, 1997). Online learning allows organizations to train and develop employees with cost saving, provide learning flexibility, better retention, unified and updated information and the ability to provide safe and easy to manage learning environment (Rabak & Cleverend-Innes, 2006; McPherson et al, 2004; Jakovljevic & Dagada, 2004) Meanwhile, Krueger (2002), states that the search functionality, whether basic, advanced, browsing or otherwise, is the greatest advantage of the online product.

Online learning is here to stay. Hundreds of universities, continuing education institutes and countless commercial organizations are turning to online learning. It gives schools the ability to extend their reach well beyond their location. For employers, online courses can substantially reduce the cost of training, especially if the organization has remote locations. Besides lowering costs, less time is spent away from the office, lower management costs result and productivity are increased. For faculty, online learning represents a new and challenging medium with the availability of graphics and multimedia enhancements, automated submission of assignments and the ability to change courses virtually instantaneously (Langan, 2002). Developing an effective, understandable and interesting online course is an interesting challenge for the institutions.

2.2.4 Courseware and Instructional Design in Online Learning

Online and distance learning requires the subjects to be delivered online, and this requires a lot if instructions and content delivery which is normally called courseware. Courseware is the collection of materials in software that automates the teaching process (Retalis, 2007). Meanwhile, courseware authoring systems can be used to develop development of cognitive skills through access of information, interactivity with tools and communication (Firdyiwek, 1999).

"Courseware" refers to content-specific instructional software which functions to generate instruction with the support of instructional delivery systems. A courseware product involves five elements: the content and the learning/pedagogical methods as its main components, the learning objectives and the medium as its attributes and the architecture which organizes the coursework in a way convenient to use (Zhiting, 1996).

"Content component involves problems solving tasks, basic terminology, review and key references. Facilitating experiences involve learners provided with activities or facilities which can be used to enhance learning such as stimulating questions, test, feedback and references. The learning experiences focus is on practicing academic genres with tutors in a virtual classroom. This function of the coursework includes genre work, resources and online help." (Thao.& Quynh 1997).

A courseware should be learner friendly whereby it can interact with the user and promote independent learning (Thao & Quynh 1997). Courseware also should consist three components whereby it represents different roles that computers can play in teaching and learning such content components, facilitating experiences and learning experiences (Thao. & Quynh 1997).

Health education also can be taught through online learning. It requires a lot more instructional technologies and technical skills. There are educational needs of healthcare professionals to acquire knowledge and skills in information processing, information and communication technology (Walker, 2000). Health informatics should devote more time in building medical curriculum and courses (Hasman, 1997) and the problem –based approach should be used in education and training of health and medical workers (Hasman, 1997). Advance technology in courseware development can be supplement to conventional books or replace them in the future (Hasman, 1997) Futhermore, interactive multimedia software design comprises of concepts, process, and evaluation (Hardin, 1997).

2.2.5 Challenges and Obstacles of Online Learning

The implementation of online learning was described as a complicated process. (Newton et.al, 2002). The planning and execution of an online learning strategy involves multiple dimensions that need to be taken together for the project to succeed (Mutula, 2002). It requires an understanding or external influences, existing corporate goals and practices, learner's needs, different learning opportunities and the support processes required. (Newton, Hase and Ellis, 2002). In Malaysia, the case of University of Tunku Abdul Rahman (UNITAR) has shown several examples that to embrace the new technology, the organization has to face several problems such as instructional materials that are passive, a learning environment that fosters isolation and communication or group tools that exists as disjoint tools (Khairuddin, 2002). The instructor has to make sure that the materials being used in the online course equals in quality to the traditional ones and that it has been well adapted to the online course. (Li & Irby 2008).

Berge (2002) has outlined ten factors that are barriers to online learning. They are administrative structure, organizational change, technological expertise, support; and infrastructure, social interaction and quality, faculty compensation and time, the treat of technology, legal issues, evaluation/ effectiveness, accessibility and student support services. Among all, organizational change is the greatest barrier to distance education across all organizational stages of capabilities which caused unadequate technical expertise. Chizmar and William (1998) highlighted in their article 'Internet Delivery and Instruction' that administrative hurdles are the outcome of the act of Internet teaching course. This added by the lack of infrastructure in place on campus to support Internet-only teaching. On the other hand, Taylor (2002) stresses more on knowledge distribution and social challenges. This includes classroom presentation synchronous and asynchronous classrooms, faculty learning curve, multimedia presentation, accessing the learners' needs, reaching distant learners, getting feedback and measurable results. Mutula (2002) stress that the sufficient resource and infrastructure is needed to enhance instructional delivery. Sufficient budgets must therefore be set aside to guarantee sustained access to the online learning infrastructure. Thus, financial implications, technological- infrastructure constraints and institutional obstacles are the challenges for online learning. This has affects on learning of adults or older students where the average technological capabilities or training would not enough to provide understanding and affordability in an online learning (Li & Irby 2008). While Okemwa (2002) stressed further, that managerial and technical challenges are a vital challenge to the online learning. Teamwork and communication infrastructure is necessary for this type of learning.

2.3 Healthcare (Conventional and Alternative) Education

2.3.1 Introduction of Conventional and Alternative Medicine

The development of the Internet has triggered unprecedented magnitude of the health revolution (Jadad and Gagliari, 1998). McKinzie defined health education as the profession of educating people about health (2009). The areas within this profession encompass environmental health, physical health, social health, emotional health, intellectual health, and spiritual health. (Donatelle, 2009). It also can be defined as the principle by which individuals and groups of people learn to behave in a manner conducive to the promotion, maintenance, or restoration of health. Hence, there are multiple definitions of health; there are also multiple definitions of health education.

The Joint Committee on Health Education and Promotion Terminology of 2001 defined Health Education as "any combination of planned learning experiences based on sound theories that provide individuals, groups, and communities the opportunity to acquire information and the skills needed to make quality health decisions." (2001). Meanwhile, the World Health Organization defined Health Education as "compris[ing] [of] consciously constructed opportunities for learning involving some form of communication designed to improve health literacy, including improving knowledge, and developing life skills which are conducive to individual and community health." (1998). The doctors will increasingly require weighing the cost of making resource and treatment decisions meanwhile medical education has been slow to help them acquire the necessary expertise (Toyle, 1998) Complementary and alternative medicine (CAM) is referred to as a group of therapeutic and diagnostic disciplines that exist largely outside the teaching of conventional health care and institutions (Zollman and Vickers, 1999). Eisenberg et al (1993) defined CAM as " interventions not widely taught in medical schools or available at hospitals". From the 1970s to 1980s, CAM was provided as an alternative to conventional medicine health care, therefore it was known as 'alternative medicine'. 'Meanwhile, 'complementary medicine' and conventional medicine developed as the two systems started to be used together in order to complement each other. Furthermore, some others like to refer CAM as 'unconventional medicine'. (Zollman and Vickers, 1999).

2.3.2 The development of Healthcare Education

The explosion of the number of technology tools over the last decade has enabled medical education in explore web-based education, virtual reality and high-fidelity patient simulation. (Vozenilek et al, 2004). There is an exponential growth of internet health seeking information and this is uniformly high (Lacroix et al., 1994). Healthcare and pharmaceutical industries used to bring everyday innovations that can mean the difference between life and death of the patients. Enspire is one of the organizations that makes solutions available to medical education. It brings unique experience, cutting edge innovation, and production values to the online healthcare education space. Changes of health services are the result of the vast changes in computers and communication technology (Towle, 1998).

In the United States alone, CAM being used by more than a third of its patient, which most of them also visits conventional physicians (Winslow, 2002). According to the US bureau of statistics, from 2006 to 2010, chiropractic and massage therapy alone have faster development than average growth of conventional medicine. The explosion of electronic information content concerning medicinal plants can be useful to CAM health aid (Hoareau and DaSilva, 1999). This kind of practice, continues spreading from all over the world, mostly in developing countries. It is seen, as a good and healthy development by UNESCO (1996).

In Malaysia, the multi-ethnic population of Malay, Chinese and Indian encourages the multicultural formation of traditional health care. They practice traditional 'hot and cold', notions of Yin-Yang and Ayurveda, cultural healing, alternative medicine, cultural perceptions of body structures and cultural practices in the context of women's health. (Ariff and Beng, 2006) CAM areas are a vast area. They include Naturopathic medicine, complementary medicine, acupuncture, holistic medicine, herbal therapy and hypnosis. (Education Portal, 2009). In the US, there is tremendous heterogeneity and diversity in content, format and requirements among courses in CAM at medical schools. Those courses were presented in lectures, practitioner lecture or demonstration and patient presentations (Wetzel et al, 1998). Public education needs to improve on early education. MEDLINE offers online healthcare information specifically in conventional medicine while the existing of CAM resources were very limited (David, 2003). Therefore, there is a need of CAM resources prepared and identified by medical librarians to educate health professionals.

2.3.3 Teaching Healthcare Education Online

Healthcare education is increasingly taught through online with the existence of technological tools. Vozenilek et al (2004) suggested that every educators of medical doctors should have access towards medical education materials via the internet, computer based-training and other effective education methods for point of service information, continuing medical education and training. There is a need for the medical education in manipulating the new information technology and help future doctors to shape and adapt the future changes. Towle (1998). The education system should be able to respond to rapid changes in the world technology which would involve employers and users of health services. There is also a need in improving the effectiveness of continuing medical education, such as developing better programs about doctor-patient communication and inter-professional continuing education. (Towle, 1998).

Health educational institutions are increasingly promoting their courses and modules through online learning. The culture of the education system has been shaped by performance in examinations and emphasis on factual content, must be changed to one which values self-directed learners and problem solvers (Toyle, 1998). The doctors were predicted to learn the experiences with the other professionals and training groups, including those outside the health sector. (Towle,

1998) suggested that Complementary and Alternative Medicine (CAM) in the 21st century must be:

- Educationally effective in relation to health outcomes
- Planned systematically on the basis of needs assessment and prioritization
- Responsive to rapid changes in the world
- Inclusive of service providers and users
- Addressed to promote self directed learning and problem solving

The blooming of communication and technological tools would increase the development of healthcare education online. Health and medical education technology will be presented across specialties, patient simulation, virtual reality and web which will enable medical students and residents to communicate, simulate, doing practical and teach everyone. (Vozenilek et al, 2004). A commitment by the research community and support from governments and industry are needed in order to conduct high quality research on CAM. (Nahin and Straus, 2001)

2.4 Multi Section

2.4.1 Introduction of multisection

Multisection is the term we use to define structured and systematic sections [objective, tutorial (with and without video segment), quiz and test] which separated between each other for learning healthcare subjects in 3D Virtual Worlds. The development of self directed online learning in 3D Virtual World healthcare environment involve the courseware development which very related with the use of instructional design. Therefore, the use of different important section of objective, tutorial, quiz and test section was considered in this study and we called it as multisection. This multisection is part of step of learning which already established in designing 2D or web courseware but not yet being used in 3D Virtual World. Therefore, the usability of using the multisection (objective, tutorial, quiz and test sections) in 3D Virtual Worlds for presenting health care skills and extracting the derived guidelines was discussed in further.

Healthcare courseware in 3D Virtual World online environment is important in enhancing student healthcare knowledge and skills besides learning in traditional classes and lab training. Instructional design should be used in creating self instructed learning whereby the step-by step instructions are necessary in giving guidelines since no instructor is present in this self-learning interface. Multi Section elements are important in creating a complete instructional courseware whereby the students may learn, train, enhance, recall and check their own performance and understanding of a particular health subject and topic.

2.4.2 Concept of Multisection

Instructional design strategies may be repeatedly employed in multiple course sections to increase online student engagement, encourage critical thinking, and enhance student learning (Quitadamo, 2001). Retalis (2007) listed and described about phases activities in web courseware development such as courseware specification (definition of target audience, aims and objectives, subject matter; specification of pedagogical methods and assessment methods), instructional design (allocation of content and learning activities for courseware parts and for each courseware component design of structure), multimedia design and development (design of text, graphics, sounds, animation and video) and courseware integration (maintenance for correction, perfection and adoption). Blackboard and WebCT are early versions of online courseware. Some empirical studies suggest that mental effort is required for both instructors and students to cognitively interact online (Knock, 2008).

The experience of using online learning is more challenging compared to conventional learning but believed to be more beneficial to both students and educators (Kenny, 2002) Using e-learning technologies offers learner control over content, learning sequence, pace of learning, time, and often the media (Ruiz, 2006). Online adaptive questionnaires for health education can be used as an educational survey research instrument to collect students' opinions on proposed health education courseware (Jiang, 2000). Empirical studies also can be used to derive information on system functionality, user-interface design, and students' reactions to the online courseware (Jiang, 2000).

Instructional design is an important element when designing online learning content delivery. There is a need for designing learning resources as alternative face-to-face classes (Dalgarno, 2002). The strategy involves building online learning communities which promote productive and satisfying learning interactions, and develope student problem-solving and critical thinking abilities for online learning environments (Quitadamo, 2001). Most learners have a limited working memory, thus instructional representations should be designed with the goalof reducing unnecessary cognitive loads where cognitive architecture, individual differences and prior knowledge need to be considered (Cook, 2006).

Gagne (1985) has defined 9 general steps of instruction for learning. These events of instruction are necessary to promote the internal process of learning. They are as shown below:

1. Gain attention
2. Describe the goal
3. Stimulate recall of prior knowledge
4. Present materials to be learned
5. Provide guidance for learning
6. Elicit performance
7. Provide feedback
8. Assess performance
9. Enhance retention and learning transfer

Flagg (1990) has defined the four step as a process of developing educational materials. They are planning, design, production and implementation. Instructional designers and training developers normally adopt an ADDIE (analysis, design, development, implementation and evaluation) process for crating learning material which is normally called the Instructional System Design model (ISD). This ISD model adopts a behaviorist or cognitive stance. The Instructional Design Process involves several strategies such as identifying a learning need or purpose, acquiring an understanding of the context of that need or purpose (the institutional culture, identifying the target audience, the pre-instruction knowledge level of participants, and the available resources and time table), designing instruction to meet that need or purpose, developing the materials and methods to deliver the instruction and finally evaluating the delivery and the learning outcomes of the instruction (Whitmyer, 1997).

2.4.3 The Rasional of Using Multisection in a 3D Virtual World Online Learning Environment

Objective, course content (tutorial), memory enhancement (quiz) and summative assessment (test) are steps of learning new lesson. Meanwhile instructional strategies and video segments are expected to produce positive effects on the usability of learning in 3D Virtual World online learning environment. Online training is the advantage and an extension to faculty work (Gold, 2001). Only a few hours of instruction can produce large effects for knowledge and more hours are required for the development of attitude and practice effectiveness (Cornell, 1985). Users are more comfortable in interacting with avatars that resemble their real live appearance (Boulos, 2007). Different learning styles may enhance student teaching (Carver, 1999). Educational effects of repeated curriculum-based measurement and evaluation may result in greater realism which respond to student progress, increase instructional structure and students more aware of goals and progress (Fuchs, 1984).

There is a need for better tools and clear pedagogy in building multimedia courses which relate to a seamless and aesthetic combination of structure and presentation. (Benyon, 1997). There are four main sections suggested for online learning and training in virtual worlds which include certain strategies. Strategies for virtual classes require certain criteria such as the importance of interaction and feedback, learner control, access to directions and help, consistency and organization, and assessment and record keeping (White, 2000). Effective and quality courseware design, may produce motivation, direction, goal setting, progress monitoring, self-assessment, and achievement which are similar to traditional classrooms (Sun, 2005).

The use of computer technology has proved to be beneficial for educational means. The computer has proven to be a cost-effective method of health education acceptable to both patients and staff (Ellis, 1982). *The authoring tool also can be used for collaborative and authoring in dynamic courseware generation (Vassileva, 1998).* Multimedia courseware can be developed based on ADDIE methodology to promote and enhance education such as in Malaysia (Muda, 2005). The possible optimization of Second Life can be done through applications place on clients, servers, and the network (Kumar, 2008). In this research, we use the multisection framework to enhance the learning in 3D Virtual World online learning environment, specifically in healthcare subjects.

2.4.3.1 Objective Section

Planning of course curriculum can be done with architecture needs, aims and objectives, content scope, organization, assessment, communication, environment and management (Harden, 1986). There are three components suggested for virtual and blended courses: 1. learning objectives, 2.learning activities and 3. learning outcomes (Whitmyer, 1999). The objectives should be stated to reduce content for instrumental role (Stenhouse, 1975). Course learning goals and students' needs should be considered first and foremost when adopting new technology (Mayrath, 2007). As a conclusion, objective acknowledgement at the beginning of a course lesson presentation is highly recommended. Metaverses present a single seamless and persistent world where users can transparently roam around (Kumar, 2008). Hence, the objectives should be defined in order for the student to focus on the correct direction and not waste their precious time.

2.4.3.2 Tutorial Section

Tutorial section is the section which contains the content of the lesson after the objective has been defined before hence. The tutorial should be planned to adapt course generation with todays needs such as the integration of distributed content, dynamic adaptation of a generated course, new forms of interaction, and offering course generation as a service (Ullrich, 2007). Computerized tutorial usage may have an effect on course performance (Chaparro, 1990). Virtual reality should focus on content and style interface which will make it as powerful as traditional media

(Bates, 1992). The dynamic colour in virtual worlds is suspected to distract student's attention which suggests further empirical research in the design aspect *(Erdley, 2008).*

3D graphics presentation can attract students to learn more. The crucial components of 3D Virtual World are the experimental architecture of both changeable and unpredictable components for designing static space for learning and gathering (Ayiter, 2008). Computer assisted learning applications generally require the student to follow the content without immediate or direct supervision from the tutor. Its materials are initially much more labour intensive and time consuming to prepare than most face to face courses such as in medical education (Greenhalgh, 2001). Quality courseware development may include courseware development approaches with established and evaluated software engineering methods and techniques (Grutzner, 2002).

Advance technology in a 3D Virtual World offers more interesting learning through tutorial sessions. Technology has the potential to enhance and transform teaching, but it can also be used inappropriately or in ways that actually interfere with learning. Moving a course online may decrease rather than increase access; increase isolation by forcing students to spend many hours at computer screens or result in reduced motivation as the novelty wears off (Salter, 2003). The interactive nature of distributed learning environments offers innumerable possibilities for interactive activities to take shape within an appropriate instructional design of coursework. With regard to interactive activities, the instructional designers and developers may create virtual communities where the learner and instructor can interact in numerous levels (Hassan, 2000).

Tutorial in 3D Virtual World offers students the opportunity to learn healthcare subject. 3D Virttual World offer tutors and students 'learning by doing' activity as alternative methods to teach medical knowledge and gain procedural experience. (Vozenilek et al, 2004) Enspire stress more on training, which should be front and center. This could involve teaching caregivers new treatments, informing researchers about new regulations, or educating patients about their healthcare options. Vozenilek et al (2004) suggests that nationally accepted protocols for the proper assessment of virtual reality (VR) applications should be adopted and large multi-center groups should be formed to guide training in medical education. High –fidelity simulation such as emergency medicine residency programs should consider the use of high-fidelity patient simulators to enhance the teaching and evaluation of core competencies among trainees. 3D presentations can be enhanced through multisensory representation (visual, tactile, proprioceptive and auditory cues) (Spence, 2004).

3D Virtual World offers beneficial features compared to 2D conventional Web such as navigating multi-media content, realistic voice chat, live events (lectures, conferences, festivals, and concerts), developing social skills, trading (selling, buying or advertising real or virtual goods), play multi-player games, vacation , browse information and 3D libraries (Boulos, 2007). Complex design and visualization are required a its include educational for training and clinical uses in health and medicines (Bowman, 1999). The problem based learning (PBL) approach is effective in 3D virtual reality learning either on or off campus (McAlphine, 2005). Learning in Second Life comprises three significant theoretical foundations such as social constructivist, task-centered instruction and situated learning environments (Semrau, 2009).

Second Life offers a lot space in presenting the courses which can be presented through Tutorial section. Reflective practice can be done in Second Life through synchronous (chat or conferences) and asynchronous (like discussion board) process. All previous discussions, conversations and lessons learned can leave a trail in Second Life (Boulos, 2007). A virtual laboratory can be created in Second Life platform which contains interactive learning resources and communication within users (Sime, 2008). Learning experiences in Second Life are more synchronous and rapid compared to conventional web learning where the navigation is easier and more fancy where the user may fly, walk, run, riding virtual vehicles or even teleporting to different locations simultaneously (Boulos, 2007).

2.4.3.3 Quiz Section

Health instruction was effective in meeting program objectives as taught in traditional classrooms, and health program effectiveness was strongly related to the level of implementation (Cornell, 1985). The quiz is the section of the learning environment, which could enhance memory and test the learning and understanding of the tutorial section. In this research, quiz section, is situated after the tutorial section and before the performance assessment of the test section.

Active learning and student-centred pedagogy could improve student attitudes and learning performance (Armbruster, 2009). A comprehensive memory enhancement training program will increase cognitive performance and positively influence self-assessments of memory efficacy (Mohs, 1998).

Courseware could support interactivity, provide assessment or grade management and become support for distance education (Getty, 2000). The quiz section provides prompt answer in assessment activity. Thus, the student may know and enhance their memory and understanding. This training method would influence the efficacy and idea generation whereby participants in modelling training significantly outperformed those in the lecture condition (Gist, 1989). Regularly scheduled quizzes on reading material may increase completion of reading assignments (Johnson, 2009). Dynamic assessment is very crucial to understanding students abilities and promoting development (insists performance prompts, hints, leading questions etc) during the assessment process itself (Lantoff, 2004).

The assessment process which includes structural aspects, self-regulatory activities and learner autonomy is crucial in developing online learning course (Vonderwell, 2007). Detailed assessment should be conducted to enable clearer planning towards sizes and subject design (Kenny, 2002). Self-efficacy and instructional quality were significant positive predictors of students' satisfaction (Artino, 2008). SLOODLE (Second Life and MOODLE) was developed to deliver instructional content connected to existing computer-mediated learning communities and to manage assessment data (Kemp, 2009). Unsupervised online quizzes can be used as a formative assessment in the medical health course (Kibble, 2007). A computer-assisted assessment (CAA) program (setting, delivering, collecting, marking and providing prompt feedback) can be used to evaluate student progress (Russel, 2005).

2.4.3.4 Test Section

The test section which is the last part of the 3D Virtual World multisection is one kind of assessment. Summative assessment or summative evaluation refers to the assessment of the learning and summarizes the development of learners at a particular time (Glickman, 2009). Meanwhile, summative and formative evaluation is characterized as an assessment for learning. Summative evaluation will produce information on product's efficacy. There is a need of alternative assessment approaches in online learning environment such as cognitive assessment, performance assessment and portfolio assessment (Reeves, 2000).

Assessment can be seen as the engine that drives student course activity, online or off also important in encouraging and shaping collaboration (discussions, group) in online learning (Swan, 2006). Practical assessment also can be used to avoid problems in clinical care and research (Davis, 1998). The test impact is meaningful and powerful enough to trigger changes without a need to provide training and a new curriculum (Shihamy, 1996). Technical training and support, and assessment or research in Second Life is effective for educational learning (Jarmon, 2008). Meanwhile, the use of a 3-dimensional virtual environment is also applicable for assessing and training in medical education (Broeren, 2007). Finally, using careful instructional design combined with ongoing assessment is important when using emerging technologies (Mayrath, 2007). Therefore, it is concluded that assessment developed using instructional elements can contribute a positive effects in developing healthcare course in 3D Virtual World environments.

2.4.3.5 Video (Audio Visual) Addition

Frick et al, (2002) suggested that the modules would be more interactive with the collaboration of multimedia, but it also making them more difficult to use. He has defined 5 star criteria (problem, activation, demonstration, application, integration and combined first principles) for excellent framework to develop scales to assess the online pathology modules. Reliability, quality and medium richness are the key technological aspects to be considered (Lopez and Nagelhout, 1995). In particular, the network set up should allow for both synchronous and asynchronous exchanges, students should have convenient access and the network should require minimal time for document exchange. The quality of the interface also plays a crucial role (Trevitt, 1995). The literature concerning interface design for online delivery ranges to the highly artistic (Laurel, 1990) to highly technical (Blattner and Dannenberg, 1992).

The perceived richness of the technology should also influence the effectiveness of online delivery. In medium richness theory (Daft and Lengel, 1986), a rich medium is one that allows for both synchronous asynchronous communication and supports a variety of didactical elements such as text, graphics, audio and video messages. Online learning may have elements such as video, quizzes, assigned groups, and activity guidance (Means, 2009). The social presence created through avatar may use five possible communication settings such as text only, audio only, audio and video, audio with low fidelity avatar and audio with high fidelity avatar (Gorini, 2008). The research result has shown significant difference between text and all other communication modes, which proves that audio, video, and avatar systems work similarly and better than text alone in creating the experience of social presence (Gorini, 2008).

Engagement in authentic activities has been used successful in providing academic and exercises for skill practise in an online learning environment (Herrington, 2003). Streaming video and audio will play a bigger role in delivering course materials to online learners for teaching and learning (Hartsell, 2006). Lower effects were found in collaborating video and non-video interventions to improve knowledge and treatment compliance of health education (Healton, 1993). Video intervention in health strategy has shown several improvements on self efficacy (Mathews, 2002). VOIP (voice over Internet protocol) and media streaming are potential communicators in fully immersive 3D environments (Laws, 2010). Video sessions may help students to perform physical and procedural tasks (Rickel, 1998). It is already proven that, *3D virtual worlds provide beneficial potential for experience based learning in medical or health education (Boulos, 2007).* Live video feeds may enrich the media environment of a 3D environment like Second Life (Urban, 2007). *Audiovisual integration would also compute cognitive effects on information processing of the brain (Summerfield, 2007).*

Leaders' presence through video has significant effects on students' engagement (O' Connel, 2004). The benefits of multimedia learning are more goal oriented, more participatory, flexible in time and space, unaffected by distances and tailored to individual learning styles, increased collaboration between teachers and students and also more fun and friendly (without fear or inadequacies or failure) (Reddi, 2003). The pedagogical strength of multimedia contains the natural information-processing abilities that already possess as humans, such as ear, eyes and brain while one advantage of multimedia courseware over the text-based is that the application computes better vision (Reddi, 2003). Congruent audiovisuals yield better detection (and hence better performance) than visual-only which is an advantage of stimulus congruency during training for multisensory facilitation of visual learning (Kim, 2008). Video and audio presentation are promising elements of employing ordinary communication technology to facilitate students in distance learning (Erping, 1996).

2.5 Usability Evaluation of Courseware

There are four categories that Geissinger (2010) described as important criteria for courseware evaluation. They are quality of end-user interface design, engagement, interactivity and tailorability. Steuer (1992) suggested that a methodology for measuring the efficacy of a virtual environment would be the extent to which subjects could not discriminate between it and a real environment Usoh et al (2000). While there is no general standard for evaluating the courseware, Retalis (2007) gives suggestions that the courseware should be usable (usefulness, ease of use, learnable, attitude), aesthetically attractive (easy to assimilate, visually attractive, interesting) and educationally effective (flexibe, a variety type of learning, integrated environment) (Retalis, 1997).

Very little empirical research has been done in elementary and secondary settings towards the effectiveness of online education which can serve a wide range of students (Smith, 2005). But, there is multiple performance measures that can be used for courseware evaluation (Bowman, 1999). Standards have given internal standards for courseware quality evaluation, such as usable, aesthetically attractive and educationally effective. The courseware should have criteria of usability, usefulness, ease of use, learnability (easy to learn), attitude users like it, aesthetics, easy to assimilate, visually attractive, interesting, educational efficiency, flexibility, allow variety types of learning experience and provide an integrated learning environment (Retalis, 1999). Courseware development use instructional design elements and a collaboration of graphic designers, video producer and software engineers (Benyon, 1997). From all those criteria that can be used in evaluating the courseware, we choose four of the most popular criteria (ease of use, efficacy, aesthetic and presence) to evaluate the learning presentation in 3D Virtual World healthcare in this research.

2.5.1 Usable (usefulness, ease of use, learnability, attitude)

An information system is only effective if it is able to be used (Mathieson, 1991). Experience with the technology may influence students perceived of use and usefulness positively towards the technology (Stoel, 2003). Ease of use also may influence students' perception of course delivery systems (Shen, 2006). Attitudes of the students could affect their preferences for distance learning (Katz, 2002). In addition, users' prior experience with the Internet, and the amount of time they spent on the e-learning courseware also contributes to the user usability perception (Koohang, 2004). Furthermore, users' chunk action, detection and observation are the factors that can contribute to learnability evaluation which may reduce the cost and time (Santos, 1995). Furthermore, the usability evaluation of the courseware may base on four constructs of effectiveness: 1. learnability, 2.ease of use, 3.flexibility and 4.user attitude (Ali, 2008).

3D Virtual Worlds or Second Life well suited for experiential learning environments but only a few studies mention instructional design and learning assessment in it (Jarmon, 2009). 3-D dimensional pliable surfaces may contribute to the effective presentation of visual information (Carpendale, 1995). Delivery and hindering instructors' extemporaneous adaptation of presentations in matching the audience shows the flexibility of computer-based presentation systems (Anderson, 2004). This, knowledge integration environment may offer variety of types of learning which could enhance student understanding (Linn, 1998). MUVE is a promising medium in preparing the situational learning which could support immersive, extended experiences, incorporating modelling and mentoring, about problems and contexts similar to the real world where students can gain knowledge and skills through co-interpreting data with other participants at varying levels of skills (Dede, 2004).

2.5.2 Aesthetic (easy to assimilate, visually attractive, interesting)

Aesthetics and easy to assimilate are two values which can used to evaluate a courseware development method in open and distance learning (Retalis, 1999). The ARCS (attention, relevance, confidence and satisfaction) are interfaced aesthetics measures for assessing graphic screens and which could reflects overall usability of computer systems (Ngo, 1999). Human interface designs of the multimedia courseware can be evaluated in terms of screen layout, colour design, graphic design and others (Changun, 2010). The evaluation of all components is central. The aesthetics of the course need to be evaluated in addition to the specifications, use of multimedia, implementation and instructional design.

2.5.3 Efficacy

Steuer (1992) suggested that a methodology for measuring the efficacy of a virtual environment would be the extent to which subjects could not discriminate between it and a real environment Usoh et al (2000). Social efficacy and presence may predict the continued usage of e-learning systems (Hayashi, 2004). The evaluation methods chosen must be suitable for the purpose at hand (Preece, Rogers, Sharp, Benyon, Holland & Carey, 1994) and can include workshops, focus groups, questionnaires, expert evaluations and observation techniques. All components need to be evaluated with real learners where possible. Where this is not possible, either because such an evaluation is inappropriate or because it is infeasible experienced tutors or past students of a similar course can play the role of real learners.

2.5.4 Presence in Virtual Worlds

Presence and learning are very related where by increasing the presence, the learning performance would as well increase (Lucia, 2008). Presence is defined by Usoh et. al, as the subjective experience of being in one place or environment, even when one is physically situated in another (2000). There are several factors that contribute presence: controll, realism, distraction, and sensory inputs (Lucia, 2008). Presence is important in Virtual World learning where it presents how close the interactions and presentations mimic the real world experiences (Usoh, 2000). The effectiveness of virtual environments often linked to the sense of presence reported by users of those VEs (Steuer, 1992). Usoh et al (2000) given 5 factors that are important in Virtual Environment learning: 1. degree of control, 2. immediacy of control, 3. anticipation , 4. mode of control and 5. physical environment modifiability. There are several factors that influence presence of the Virtual World program: high resolution, consistency, user-program interaction, user virtual body representation and the effects of a user's action. (Steuer, 1992).

2.6 Overall Conclusion

In conclusion, healthcare education can be taught online by the existence of technological tools. It is also believed that students in online learning conditions can perform well as better as than those receiving face-to-face instruction (Means, 2009). The process of learning through a multimedia program (combining text, audio, video, and animated graphics in an easy-to-use fashion) enables learning through exploration, discovery, and experience at low cost per unit (Reddi, 2003). Successful implementation of 3D virtual world needs good participatory design, implementation and support (Sime, 2008). Action learning pedagogy suggests a symbiotic relationship of pedagogy and technological context for teaching and learning in a 3D Virtual World (Sime, 2008). To summarize, the objective, tutorial, quiz for training and test sections and video inclusion are useful sections which should be incorporated in developing 3D Virtual World online learning interfaces. The reviewed literature demonstrated that, using a multisection framework of objective, tutorial, quiz and test sections can prevent the situation of getting lost focus during learning. On the other hand, the multisection incorporation can benefit online 3D Virtual World healthcare learning in terms of enhancing users' motivation, engagement and satisfaction as well as their learning performance.

CHAPTER 3

LITERATURE REVIEW II: Virtual World and Second Life

3.1 Introduction of Virtual World

Virtual World is a relatively a new technology and distance learning can take advantages of it. It can provide new way of presenting learning and training. There are rooms for development of health education in virtual worlds environment. 3D Virtual World would be a potential medium for distance learning which could enhance student learning experiences such as discussions, seminar, 3d presentations and other learning categories where materials are created, stored and used (Boulos, 2007). Therefore, lots of challenges of distance learning can be solved using Virtual 3D World learning environment technology. However, other issues of costs, accessibility, legal and increased development time would become the barriers for institutions in taking advantage of this existing technology (Kluge and Riley, 2008).

Virtual World is defined as a computer-based, simulated multi-media environment, usually running over the Web, and designed so that users can 'inhabit' and interact via their own graphical self representations known as avatars (Boulos, 2007). The culture of the education system has been shaped by performance on examinations and emphasis on factual content, it must be changed to one which values self-directed learners and problem solvers. (Toyle, 1998). A 3D Virtual World sometimes described as an immersed virtual environment, may offer more than external image observations which require user active participation with a three-dimensional computer-generated environment and produce experiences for them (Bowman, 1999).

Virtual worlds are simulated environments accessed by multiple users through an online interface (Book, 2008). Several other terms for virtual worlds are digital worlds, synthetic worlds and massive multiplayer online games (Book, 2008). The emergence of powerful computers and increased broadband access make virtual worlds more popular each day. Virtual worlds provide a new range of opportunities for users to navigate and interact with a pre-existing environment and extend the environment through their own imagination and purposes.

Book (2008) has described 6 features of virtual worlds. They are as follows:

1. Shared space. The world allows many users to participate at once.
2. Graphical user interface. The world depicts space visually.
3. Immediacy. Interaction takes place in real time.
4. Interactivity. The world allows users to alter, develop, build, or submit customized content.
5. Persistence. The world's existence continues regardless of whether individual users are logged in.
6. Community. The world allows and encourages the formation of in-world social groups like teams, guilds, clubs, cliques, housemates, or neighborhoods.

Neal Stephenson (1992) described metaverse through his science fiction novel ‘Snow Crash’ where humans, as avatars, interact with each other and software agents in 3 dimensional space that uses the metaphor of the real world. Metaverse uses the environment or imaginative environment or real world but it has no physical limitation of real world (Dodge and Kitchin, 2000). Meanwhile, Second Life is a virtual world developed by Linden Lab that was launched in June, 2003 and it is accessible through the Internet. (SL, 11 June 2009). Metaverse is different from online games, that it has no scores to be gained and no level to be attained. (Ayiter, 2008).

'Mobile and immersive learning environments' are, as the name indicates, environments which have mobile or immersive (e.g. 3D) components. These environments may include integrated social software tools, mobile learning, game-based learning, simulation-based learning, producing 'seamless' learning experiences and often emphasising upon collaborative learning (Bentley, 2010). Virtual World is a new technology which offers an advantage for educational field and research area. Educational courseware can be developed in this new emerging technology such the Second Life program. How to construct the courseware in the immersion program is a challenge. Bentley (2010) has suggested that students need better preparation for learning in an online environment than in the traditional classroom. Chen at.al suggest learning environment would be more practical for learners and instructors if they used a the game-based learning environment (2009). The Virtual World or metaverse has been flourished by end-users which can create, develop and interact, expanding the realm of human cooperation, interaction and creativity.

3.2 Benefits of learning in Virtual Worlds and Second Life

The versatile, immersive, creative and dynamic of 3D Virtual World learning environments would increase knowledge, self-directed learning, and peer collaboration by academics, healthcare professionals, and business executives (Hansen, 2008). 3D Virtual World experimentation has the potential as an economical and practical alternative to standard laboratory experiments where they has strategic plan (Chesney, 2007). The immersive virtual world can be used for learning through design, evaluation and lessons learned, whereby constructivist approach to learning, collaboration, and narrative development, and is designed to utilize the strengths of virtual reality (immersion, telepresence, immediate visual feedback, and interactivity) (Roussos, 2006). More empirical research suggested revealing 3D Virtual World pedagogical outcomes and advantages in an online learning (Hansen, 2008).

3D presentation and scripting language in virtual worlds would expand the teaching 7and learning capabilities for instructors and students. Educators may implement student-centered teaching pedagogies (Kluge and Riley, 2008). There are several opportunities for learning in virtual worlds such as shown below:

1. The environment is more generalized rather than contextual which allows virtual worlds to be applicable to almost all disciplines.
2. Generative capabilities which allow users to create 3-dimensional objects that can be seen and used by any other user including the creators.
3. The student may construct their experience through a sense of presence.
4. An institution can migrate from a teacher-centered to student –centered model of instruction.

5. Allows communication between students through chat, instant messaging and voice over IP.

6. Allows for authentic learning activities that are usually costly, complex, and dangerous to perform in the real classroom.

7. Active participation in 'learning by doing' through games and simulation.

8. Allows for multiple learners to communicate and collaborate on the same issue and problem.

9. Educators can prepare learners for connecting with an interconnected society and the complex world of working and living.

The environment in Second Life is created by its own residents. Second Life offers open architecture for people to develop their own imagination or planned designs. Second Life can become study virtual world itself, as a communication medium and in-world learning activities (Stephanie and David, 2009). Second Life also offers adaptive expertise in multi-user virtual environment which offers the possibilities for students to experience the events first hand and not secondarily (Bransford et al, 2007). MUVE in Second Life can be used to teach the concepts related to adaptive expertise. Second Life and other MUVEs have no background story. Therefore, the educators and designers need to create their own environment which can meet their own purposes (Richter et al, 2007). Second Life offers novel opportunities for experiential learning (Mason, 2007).

Second life can become a powerful environment for experiential learning projects. It offers relevance, involve students in experience design, apply collaboration, leverage the community and opportunity to reflect on both new and traditional media (Mason, 2007). Users are also more comfortable to interact with avatars that resemble their real life appearance (Boulos, 2007). It offers persistent environment, can support multiple users, economical value, content creation low barriers, programmable, and variety of pre-existing content (Mason, 2007). It's also more flexible, allowing learning spaces to be placed, modified, expanded and moved as needed. Virtual learning spaces also can be accessed by others at any time without real life risks such as theft and vandalism (Stephanie and David, 2009). Meanwhile, student participation in conferences can be done online throughout the globe.

Second Life offers lots of opportunities for educators and education organization do their educational practices. Joseph (2007) has given some of the best practices of Second Life such as playground versus workplace, performative, collaboration and cross-functional teams, social networking, recognize and support skill stratification, the teacher becomes a facilitator, the student becomes peer mentor, scale projects to fit resources, situate Second Life within a larger Internet ecology, leverage In-world resources, when technology fails, know when to move on, time is relative and distance learning tool. Meanwhile, Collins and Jennings (2007) suggested several best practices for campus build in Second Life such as developing groups, land names and descriptions, logos, greetings, footpaths, links to websites, campus map with teleport system, sandboxes and auditoriums and art galleries and living/ office space.

Second Life also offers simulation activities for students in their learning environment. Simulations offer visualization and sophistications that can bring students into environments that can be imagined and can be explored with simulated objects and environments which are near the real life experience (Foreman, 2003). Seconds Life is not only stand-alone computer games, but it can be accessed and used by any numbers of players simultaneously. The users can interact, cooperate, fight and do transaction (Teoh, 2007). The simulation is very important for learning, which allows students to do exercises while sharing common experiences and using it for further discussions (Square& Jenkins, 2003). Students can push, test and explore and interactive system to prepare them for the workforce (Hertz, 2002). Examples of simulation project in Second Life were the Virtual Fashion (VF) by the Research foundation of SUNYBuffaloState (2007) and Nurse Anesthesia Simulation (2009). This kind of simulated environment in second Life makes it liable for virtual business plan, theme, store layout and design, branding, product development and marketing (Polvinen, 2007).

Participating in a 3D Virtual World is believed to be enjoyable, encourages creative expression, broadens socialization skills, promotes independent problem solving, provides opportunities for self-teaching, and sets the stage for group work (Hansen, 2008*). Network opportunities also happen in a 3D Virtual World where it may connect groups of like-minded individuals* (Hansen, 2008). With the increasing telecommunication technologies such as broadband and mobile access, virtual worlds are expected to become part of everyday routine (BCS, 2006). It will become a center for trade, commerce and business. Even though the 3D Virtual World is still new especially in education, but it is believed to become part of the everyday future like the Internet used to be in 1980's before. Therefore, the chance of fully employing it for learning is very high which requires high volume of research and developments. Thus, it is expected that the 3D Virtual World would become the future web.

3.3 Constructivism and online learning in Virtual World

Constructivism is relatively new educational paradigm that is receiving considerable special attention among science educators (Staver, 1998). It asserts that learners should be viewed as cognitive subjects engaged in the process of active knowledge construction, and that such process is relevant to subjects existing knowledge structures (Von Glassersfeld, 1993). Constructivists also highlight student autonomy and encourage teachers to conduct learner-centered instructional activities (Tsai, 1998).

Therefore, the use of virtual reality for education is consistent with the merits of constructivist theory (Chen et al, 2001). A virtual world which is much closer to the real world and conducts 'active learning' with simulation definitely uses constructivist at higher level (Kafai and Resnick, 1996). Learning through Virtual Worlds being described as an active process wherein learners construct mental models and theories of the world around them. Cennamo et al, (1996) suggested the principles of constructivism learning environments, such as below:

1. Provide complex learning environments that incorporate authentic activity.

2. Provide social negotiation as an integral part of learning to allow insights to emerge through the group process.

3. Juxtapose instructional content and include access to multiple modes of

representation to allow learners to examine materials from multiple perspectives.

4. Allow reflexivity or awareness of one's own thinking and learning process.

5. Emphasize students' centered instruction where students are actively involved in determining their own learning needs and how those needs can be met.

Constructivism holds that learning can happen spontaneously when people are engaged in creating, making things or training. Therefore, constructivism is a way of making formal, abstract ideas and the relationship more concrete, more visual, more manipulate and understandable (Ayiter, 2008). Furthermore, according to Richter et al, Second Life which is one type of virtual world offers 5 types (demonstration, experiential, diagnostic, role-play, and constructive) of learner engagement.

3.4 Development of Virtual World and Second Life

The increasing use of virtual world technologies which act as platforms for end-users to create, develop, and interact, expanding the realm of human cooperation, interaction, and creativity, has flourished the metaverse (Mandelbrot, 2008). Metaverse projects have been created and gone through several developments as shown in the table 3.1 below:

Table 3.1: Metaverse development

Years	Metaverse Projects Development	Person and Organization
1993	MOO (text based, low bandwidth virtual reality system)	Steve Jackson Games (Illuminati Online)
Mid 1990's	SnowMOO	SenseMedia
1997	Active Worlds	Active Worlds Inc
1998	There	Makena Techno.
2003	Second Life	Linden Lab
2004	Open source Metaverse Project	Hugh Perkins and Jorge Lima.
2005	Solipsis	France Télécom
2005	Croquet Project	Alan Kay, Julian Lombardi, Mark P. McCahill, Andreas Raab, David P. Reed, and David A. Smith
2008	Google Lively	Google Inc.

In 1999, Philip Rosedale has formed a program which enables the computer users to be fully immersed in a three hundred and sixty degree virtual world experience (SL, 11 June 2009). In January 2008 alone, Sesond Life residents spent 28, 274, 505 hours in a SL environment and about 38 000 residents on average logged in SL in any particular moment (SL, 11 Jan 2008). Since then, Second Life has been used for the means of business and marketing, entertainment, arts, education, religion and beliefs. The number of accounts in Second Life increases every day. Thousands of educators exploring Second Life and hundreds of University and Colleges purchase land as private space in second Life including Bradford University. This is due to the inexpensive and easily modified environment of virtual worlds (Stephanie and David, 2009).

Citizens of Second Life are called ‘Lifers’ and their currency is Linden dollar which can be converted to US dollars. Some consider Second Life as a 3D social network which seems similar to the 3-D wiki space collaboration of meeting each other and interaction of fully textured high-resolution avatar and 3D objects (Boulos, 2007). Second Life were also called as immersive and rich experience which combines lots of Web 2.0 features, such as instant messaging, voice chat, profiles and real-time social networking, and a unique form of online social interaction that involves sharing various objects and creative collaboration on building and running places and services in the virtual world (user-generated content) (Boulos, 2007).

3.5 Second Life Program (UK vs Malaysia)

In UK, Second Life as one of the Virtual World programs has been studied by various organizations such as colleges, universities, industry, and other educational bodies like JISC and Scottish Further Education (John, 2007). Second Life that was launched in 2003 by Linden Lab is an Internet-based Virtual World (John, 2007). SL is one of an online MUVE (multi-user virtual environment) which can be used for many kinds of activities. John (2007) has stated 9 types of SL activities that are being used by UK academicians in Higher or Further Education institution, such as thinking and grouping, actively planning the presence, research, developing tools and simulations, exhibition, presenting center or department, supporting courses or modules, developmental cross department support and campus presence.

An accurate figure for UK institutions developing their work in SL is difficult to determine during their early development since some used to hide their real name of institution and close their project towards the end for minimizing the disturbance. However, it can be seen the disclosed development number is increases each year. In 2007, about 40 institutions were involved (John, 2007) and increases to over 100 in 2009 (Stephanie, 2009). This figure will definitely increase in the future. This development, is hoping to give better ways of manipulating Virtual World technology in various fields such as commerce, education, health, social status and management.

Globalization and modernity is always intertwined which the mastery of global communication can enhance education, commerce and their government. (Huff, 2001) Currently, Malaysia does not adopt Virtual World technologies especially the Second Life platform in any of their teaching or training programs. This might due to the slow connections to the Internet while Second Life is an online Virtual Learning Environment which definitely depends on Internet speed. Malaysia even though made strategy and advanced implementation of an Internet based of “multimedia super corridor” but still did not fully meet their objectives.

3.6 Online learning and healthcare education in 3D Virtual Worlds

A 3D Virtual World can offer a lot of advantages to healthcare education and online learning. In medical education contexts, e-learning appears to be at least as effective as traditional instructor-led methods which compliment to it and form blended learning (Ruiz, 2006). Use of learning technology in medical education will shift the role of educators to facilitators (Ruiz, 2006) whereby health informatics are suggested to be part of the core curriculum at health school (Kenny, 2002). Health services in a 3D Virtual World used to dealing with stroke support, cerebral palsy, mental health and autism (Boulos, 2007). There are a lot of technological tools that can be connected to 3D Virtual World for educational purposes. PDAs and mobile phones can be used to connect Virtual World to real health situations which include follow-up, training and homework and community connections (Gorini, 2008). Bio and Activity Sensors are also used to connect the real world with 3D Virtual which may track the health status of users and influences their experiences (Gorini, 2008).

Communication and collaboration also can be used in connecting 3D Virtual worlds to real life scene and activities. 3-D avatar-based is an advantage to facilitate the communication process between therapist and patients (Gorini, 2008). 3D Virtual World is also used as a support tool for psychological interventions which use their strong sense of presence and social connections elicited by the avatar (Gorini, 2008). 3D Virtual World can collaborate with Virtual Reality such as exposure therapy (Gorini, 2008). Stephanie and David (2009) described that developing medical learning program in Second Life can produce low cost, rapid development and secure place. Thus, Virtual Worlds offer great potential for medical, health educators, and librarians to take advantage, but more research is needed into their use in medical and health education (Boulos, 2007).

Meanwhile, simulation in 3D Virtual World such Second Life is very ideal for medical students to gain new skills without the risk of harming patients or themselves (Boulos, 2007). This requires complex design, visualization which includes educational both training and clinical (for health and medicine). It also could resemble interaction like real-world situations with complex VE applications which could enhance the physical, cognitive and perceptual capabilities of the user. Sometimes the design can allow users to do things that are impossible in the real world (Bowman, 1999). Therefore, is no project of complementary and alternative medicine in Second Life ever developed. Therefore this research is the first CAM subject ever build in Second Life. Examples of health projects in Second Life are shown in the table 3.2 below:

Table 3.2: Examples of educational health projects in Second Life

Project title	**Organized by**	**Project info**
Nurse Anesthesia Simulation	University of Kansas Medical Centre	Operating Room Simulation: (educause.edu, 2009)
Emergency Preparedness Training	Chicago School of Public Health CADE at Illinois University	Emergency Preparedness training- to save first lives, (Ullberg et al, 2007)
Centers for Disease Control	US Centers for Disease Control and Prevention	Promote public health (http://www.cdc.gov)
Schizophrenic hallucinations	Peter & James University of California	Educate people about schizophrenic hallucinations

Gene Pool	Mary Anne Clark, Texas Wesleyan University	Simulated lab experiments, tutorials and simple videos of genetics lab/museum
Heart Murmur sim	Jeremy Kemp, San Jose University	Sounds of different types of heart murmurs
Nutrition game	Ohio University Sim	Different eating styles and their effects
Ethics Counselling	Chicago School of Public Health CADE at Illinois University	Developed prototype counselling site (Monahan et al, 2007)
HealthInfo Island	US national library of Medicine	Second life Medical and Consumer Health Libraries
Virtual neurological education center	Lee Hetherington, Plymouth University	Symptoms of people suffering from neurological disability (http://www.vnec.co.uk)

3.7 Potential of Constructivism in 3D Virtual World and Second Life

Teaching effectiveness in medical education very related to effective faculty development (experiential learning usage, feedback provision , effective peer and colleague relationships, well-designed interventions following principles of teaching and learning, and diversity of educational methods within single intervention usage) (Steinert, 2006). International virtual medical school (IVIMEDS) is suggested for the future of medical education where it suggested blended curriculum (new approaches to curriculum planning / mapping and a flexible curriculum which meets the needs of different students and has the potential of increasing access to medicine) and innovative e-leaning (approaches to the new learning technologies including e-learning and virtual reality; and advanced instructional design based on the use of 'reusable learning objects') (Harden, 2002). The instructional strategies which include certain theories (The Health Belief Model, Social Cognitive Theory, and Diffusion of Innovation Theory) may encourage health behavior change for the health education design (Kinzie, 2005).

Constructivism theories can be used in developing learning environments in 3D Virtual Worlds. Virtual worlds is an contructivist environment which provides tools (discourse, experiential and resource) for distance education (Dickey, 2003). There is the potential of using 3D learning environment for learning science in tertiary education (Dalgarno, 2002). The challenges of designing education in 3D learning environment are development and maintenance (Dalgarno, 2002). Instructional designers may use the same strategies and tactics for designing games for learning in a 3D Virtual World to engage learners (Dickey, 2005).

Online (3D) virtual worlds are emerging technologies that have a lot of benefits. They offer unique learning opportunities for traditional and distributed education and used in synchronous and asynchronous distance learning (Dickey, 2005). A 3D virtual world also provides countless opportunities for constructivist activities through engagement when dealing with both concrete and abstract representations of data / ideas and can support distance learning by facilitating collaboration, community, and experiential learning (Dickey, 2005). Immersive environments which are similar to the virtual world, allow learners to interact with data or knowledge representations that are not possible to replicate in a traditional classroom setting and provide opportunities for learners to gain new perspectives (interacting with materials, information, models, and tools) (Dickey, 2005). Meanwhile, Second Life is part of a continuum of instructional technology tools in twenty- first century developments and educational theory (Cheal, 2007). A virtual reality environment might play a role in practical applications such as is suggested by Stuart and Thomas (1991) whereby exploration, interactivity, construction, and manipulation are critical in this learning environment. Chen (2006) has developed a design theoretical framework for a virtual reality based learning environment as shown in the figure 3.1 below:

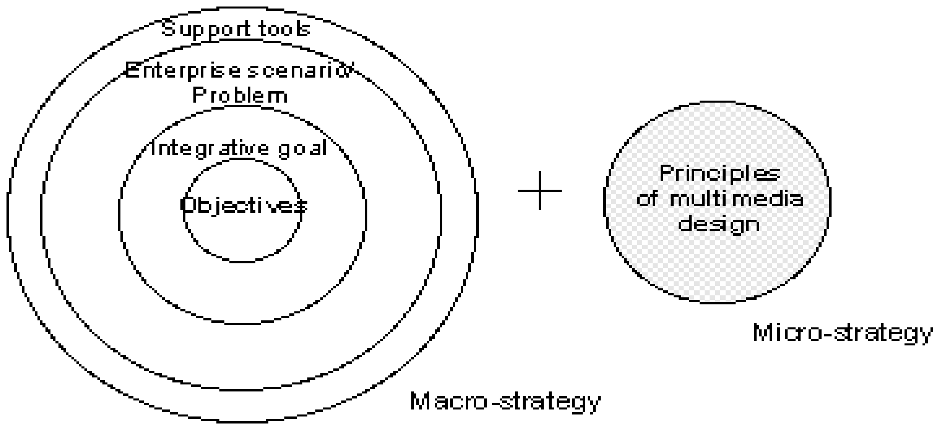


Figure 3.1: Instructional design theoretical framework of the VR based learning environment

In this model, Chen has manipulated the macro-strategy and micro-strategy. The macro-strategy is derived from Gagne and Merrill integrative goals strategy and Jonassen model for designing constructivist learning environments. Meanwhile, the micro-strategy is derived from Mayer’s principles of multimedia design. Kluge and Riley (2008) highlighted that instructional design and assessments need to be reconsidered in order to accommodate and promote learning in Virtual Worlds. The effectiveness of the courseware is evaluated throughout the development whereby the questionnaire is used with diverse health groups that have different health lesson example in the Virtual World. Because instructional technology is directed towards digital forms, therefore the instructional materials needs to be in digital to support Open and Distance learning (Retalis, 2007). Instructional design must have and follow its own instructional objectives (Hardin, 1997).

Instructional tools and design could enhance virtual learning environment which require instructional designers to integrate heterogeneous technologies and multiple pedagogical approaches that link courses, resources, formal communication and informal communication, and administration (Dillenbourg, 2002). Online instruction allows students opportunity to students who work full time, live in rural areas, or suffer from physical disabilities to obtain the education they need and improve their professional or even their personal lives (Knock, 2008). PROFIL is a method used for the development of multimedia courseware that integrates instructional design methods and techniques with software engineering methods that have media selection in their design methodology. The six phases of PROFIL are preliminary investigation, definition, script, technical realization, implementation and exploitation (Koper, 1995).

3D Virtual Worlds provides an excellent platform for achieving performance results especially when designing for specific users and specific program. Virtual worlds also can be defined as technology-created virtual environments that incorporate re-presentations of real world elements such as human beings, landscapes and other objects (Knock, 2008). 3D Virtual World is believed to impose greater feelings of presence (Gorini, 2008) and a direct link between the real world experience which would improve information accessibility and real world knowledge transfer (Gorini, 2008). 3D virtual world also encourages active learning which could provide valuable experiences that could enhance engagement, promote participation, and motivate self-directed learning (Hansen, 2008). Immersive visualization (e.g., virtual environment) becomes a visual tool which can be utilized to accelerate and enhance pedagogical practices in computer science concepts of educational institutions by creating courseware (North, 2004).

Second Life, is being said as a new platform for education which supports rich communication, virtual collaboration and 3-D content creation (Zhu, 2007), therefore courseware design can be done by using in Second Life platform. The design of setting architecture in a 3D Virtual World can be done in 3 stages; the implementation level, the representation level, and the interface level (Maher, 1999). Courseware also can be developed in the Virtual World by using the help of the Moodle program, internal programming / scripting (Second life; Linden) and other collaborative softwares. Moodle is an open source of an internet-based course constructed courseware tool (Dougiamas, 2002).

3.8 Challenges and Problems of learning in 3D Virtual World Online Environment and Second Life

Virtual Worlds is relatively new for distance learning education. The issues of costs, accessibility, legal and increased development time will become the barriers for institutions that make use of this existing technology (Kluge and Riley 2008). Kluge and Riley (2008) describe the challenges in accommodating education in virtual worlds from a student's perspective, such as below:

1. Inadequate number of computers that meet the minimum requirement for optimal use of virtual world.
2. Robust hardware and broadband internet connection is needed.
3. Liability issues such as purchasing the land in second Life.
4. Development time for simple courses is higher compared to 2-D web normally required.
5. Standards for accessibility is still low, such as virtual world not work yet with screen readers that would be restricted for students which is visually impaired.
6. Creating and scripting objects are a challenge for the students who are not from the technical disciplines.
7. Special skills are needed in creating classes in virtual worlds.
8. The cost of purchasing and maintaining the land is quite high.
9. Students may be subjected to sex, violence or disruptive players at public area in virtual worlds and no legal action can be made towards the harassers.

There are certain problems and challenges connected to developing and using 3D Virtual World such as Second Life as learning space. There are ethical issues which arise similar to 2-D Web conventional learning that needs to be taken into account, such as Internet addiction, gambling, violence, pornography, trust, identity and privacy issues, copyright issues, health information quality and quackery issues and vandalism. Second Life is still new and need certain enhancement to become a successful learning program. The 3D Virtual World program also needs adjustment and enhancement towards in-world (interface) graphics for an optimal visual experience and fast-Internet broadband connection (Boulos 2007). One of the challenges of using 3D Virtual World like Second Life, is that their high subscriptions' cost (Gorini 2008). Another challenge of 3D virtual world application is the learning space and creation time involved (Hansen 2008).

Second Life mainly lack of learning management systems which contradict to the Blackboard, WebCT, Moodle and other LMS. There was an effort to integrate Second Life with LMS. Jeremy and Daniel (2007) identified that there was a strong interest of integrating LMS with Second Life. Sloodle is one example of integrating LMS from Moodle with SL. A Virtual World offers a place for students to create their projects according to assignments given by tutors and viewable within the virtual world (Boulos, 2007). Creating a self-learning course module would be an advantage to making a Virtual World platform such as Second Life act as a place for learning and training.

Learning through Virtual World or 3D Virtual Learning Environment (VLE) or a Multi-User Virtual Environment (MUVE) can cause frustration, boredom and lost (Sanchez, 2007). Second Life lacks of instructions and the students did not really understand the purpose of learning. The students have problems relating the Second Life experience to the course material. Students explained inadequate instructions in Second Life activities that resulted lost in completing the tasks and caused frustration. There is also the need of performance evaluation for determining the understanding of students towards the program (Stephanie and David, 2009). Kluge and Riley (2008) highlighted that instructional design and assessments need to be reconsidered in order to accommodate and promote learning in Virtual Worlds. Below is the diagram (figure 3.2) by Sanchez (2007) of student experience in Second Life.

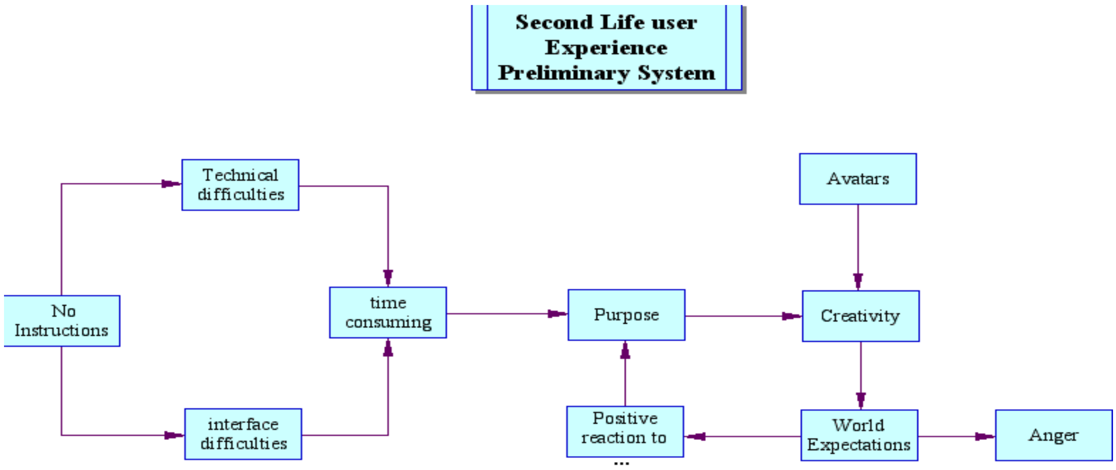


Figure 3.2: System diagram of Second Life Student Experience

From the diagram above, it supported the previous statements of learning problems in Second Life such as no instructions, technical learning difficulties and time consuming which finally cause anger and frustration to users.

3.9 Summary

Currently, learning in Second Life program provides healthcare learning benefits of training, simulations and 3D graphics as experiential learning. Furthermore, online healthcare learning in a 3D Virtual World may contribute to cost reduction, patient safety, increased productivity and time saving. However, there are potential of lost, time wasting and difficult to focus occurred caused by less direction given at the beginning and during the learning experience in 3D Virtual world program. There is also no systematic design template for each course module provided. Therefore, users' attention towards the delivered learning information and learning objective can not be reached. Also, users are not always satisfied with the 3D Virtual World environment online learning interfaces. Therefore, the development of a structured course module in a 3D Virtual World of Second Life is expected to help solve those learning problem.

Nevertheless, user views regarding the use of specific sections needs to be captured in order to obtain an overall feedback for their perception and satisfaction about this multisection framework design inclusion when used within 3D Virtual World online learning environments. Also, the reviewed literature may shed the light on the creation of a courseware using 3D Virtual World program for healthcare learning which involves avatar, 3D environments and experiential learning. Furthermore, the online learning literature highlighs the need for additional research to integrate the instructional design of OTQT framework and video segment in the healthcare course of 3D Virtual World online learning where there is a potential for usability and learning enhancement.

The starting point of this research was initiated by motivation to investigate whether the multisection (OTQ- experiment 1 and OTQT-experiment 2) inclusion in online 3D Virtual World learning environments interfaces produce an effect on its usability. In addition, a strong encouragement has been established to evaluate the usability and the role of each section of multisection (OTQTV-experiment 3) incorporated in online 3D Virtual World healthcare learning environments. The investigation undertaken in this research might provide an additional insight into the usefulness of the multisection incorporated in a 3D Virtual World learning environments not only in teaching health care but also in other subjects as well.

CHAPTER 4

EXPERIMENT I: The Usability Study of Virtual World Courseware (VWC)

4.1 Introduction

This research introduces the use of multisection of objective, tutorial, quiz, test and video sections incorporation in the online 3D Virtual World online environment of teaching and learning healthcare course. The literature review for the Chapter 2 found that, multisection of objective, tutorial, quiz, test and video is used for the developing a courseware using 3D virtual world specifically in Second Life program. Using only 2D and 3D situated environment is not interesting and beneficial enough to teach healthcare courses while learning through 3D virtual world online environment (without multisection) course boring, lost and wasting time with wandering around [Sanchez (2007), Kluge and Riley (2008), Stephanie and David (2009)]. Therefore, instructional of strategic OTQ (objectives, tutorial and quiz) sections frameworks were introduced in this research.

The literature in second chapter had shown that developing instructional courseware for teaching healthcare in 3D Virtual Worlds online learning environment was expected to be usable which needs an enhancement towards strategic and systematic of multisection (objective, tutorial and quiz sections). Current health care teaching and learning in Second Life program does not have combination and fully segregation of structured sections learning. All of the elements are crowded and systematic eventhough its consist elements of objective, tutorial and quiz but they were very simple and little which shown in the table 4.1 below.

Table 4.1: Current health project learning strategy in Second Life

Project	Strength (consist together)	Lack
Nurse Anesthesia Simulation	√ simulation √ chat √ practice √ lecture	× objectives × instruction guides
Emergency Preparedness Training	√ lecture √ experience learning √ safety	× quiz × objective × guidelines instruction × test
Centers for Disease Control	√ 2D tutorial √ map	× 3D elements
Schizophrenic hallucinations	√ experience learning	× objective × map and instruction guide × quiz
Gene Pool	√ quiz √ video √ 3D tutorial and elements	× objective
Heart Murmur sim	√ objective √ tutorial √ test	× map × instructional guide × quiz for training
Nutrition game	√ game quiz √ simulate result	× 3D health elements × tutorial × objective × test
Ethic Counselling	√ interview	× 3D tutorial × objective
HealthInfo Island	√ lots of info tutorial	× training quiz × objective
Virtual neurological education center	√ animation tutorial √ video lecture	× 3D tutorial × simulation tutorial × video on techniques

This chapter described the first experiment that has been conducted to explore the usefulness of health care module courseware in 3D Virtual Worlds online environment with OTQ framework and gather suggestions for enhancement in further development. This first experiment acts as pilot studies and aim to gain formative information in term of technical, design strategies and instructions. The second experiment in Chapter 4, would investigate the role of each main section involved in virtual World courseware while the third experiment would investigate the addition of video segments in the tutorial section according to the limitation in the second experiment. This pioneer healthcare Virtual World Courseware (VWC) in this first experiment contains 3 sections which are objective, tutorial, and quiz part (OTQ framework). This OTQ framework is the first framework in this research. The following sections provide a detailed description of research aims, objectives, experimental platforms, sample, testing procedure, result and discussion. Figure 4.1 shows multisection of OTQ framework and it content and Table 4.2 shows elements used in this first experiment.

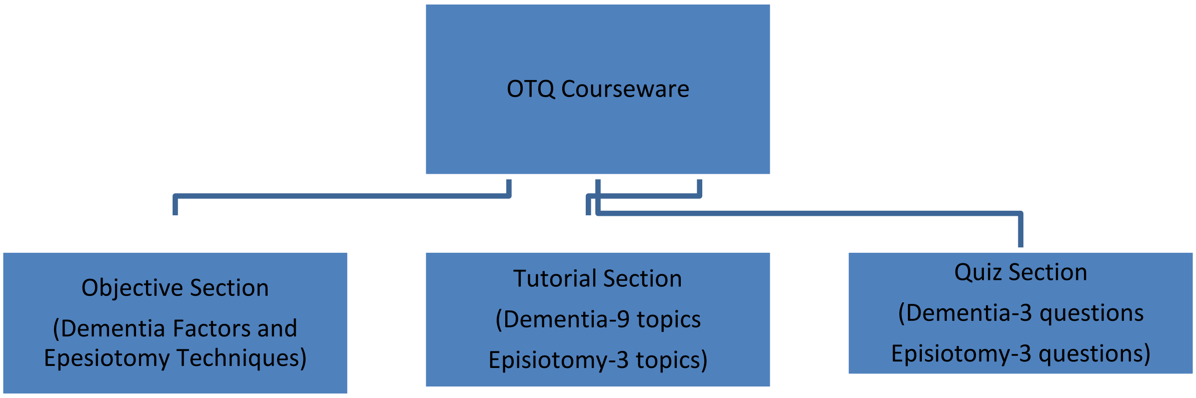


Figure 4.1: OTQ framework and content

Table 4.2: Elements used on first experiment

3d situated environment	2D graphics	3D graphics	Evaluation elements
Building hospital 1 (ward, class, lab)	2D Text (Dementia factors and episiotomy techniques)	3d equipments (signboards, glass, foods)	Quiz (3 questions each subject)
Building hospital 2 (ward, class, lab)	2D images (map, dementia factors and suturing techniques)	3d presentation objects (board, balls, arrows)	

4.2 Aims of multisection of OTQ courseware framework

Development of healthcare learning in Second Life or 3D Virtual World program was chaos, not instructed and less systematic (Section 3.8). Therefore, we design instructional multisection self-instructed with the help of Gagne's principles to contribute to healthcare learning in 3D Virtual Worlds online environment. Thus, the first and foremost aim of this first experiment was to know the effect of multisection OTQ health care Courseware framework in 3D Virtual World online environment on the overall usability. The second aim was to obtain an overall feedback and suggestions from the users in regard to the courseware in 3D Virtual Worlds online environment courseware. The third aim was to gather information for further prototype development. It also aimed at testing the usability aspects of the self-learning Virtual World courseware in term of user's performance (effecttiveness) and perception (ease of use, aesthetic and efficacy). Users' performance was evaluated by using the questions in the Quiz Section and the user' perception was evaluated through positive answers, comments and suggestion in the close and open questionnaire. Since this is the initial experiment for evaluating the usability and the format of courseware in 3D Virtual Worlds online environment for learning health care, this experiment also can be regarded or acts as pilot experiment and formative study.

4.3 Objectives

In order to meet the aims stated in section 4.2, the following objectives were considered:

1. Development of experimental platforms that present two healthcare subjects.
2. Carrying out an experimental investigation.
3. Obtaining the users' views through a questionnaire.
4. Measuring the efficacy of the courseware presentation by the percentage of the correct answers answered by the users in Quiz Section.
5. Measuring the effectiveness of the courseware design by the positive questions average ranking.
6. Obtaining the users' suggestions for enhancing further prototype design.

4.4 Hypotheses

It was expected that the usability (user performance and perception) of a courseware in an online learning and the users' learning performance would be influenced by the experiential learning and presentation of online 3D Virtual World environment through three sections (objective, tutorial and quiz and test) of OTQ framework of VWC program. Accordingly, the following hypotheses have been derived.

H1: Users of the VWC is expected getting more than two third (normal distribution) in term of average correct answer percentage of the quiz result.

H2: Users of the VWC will express positive views in term of user perception (ease of use, efficacy and aesthetic) in close ended questionnaire.

H3: Users of the VWC will express positive views in term of user satisfaction in close ended questionnaire.

H4: Users of the VWC will give views comments and suggestions for possible instructional enhancement in further prototype development.

4.5 Experimental Platform

This study is based on finding the way of creating and presenting a health course module in a courseware using 3D Virtual World. This platform is much closer to the real world as it prepares ‘active learning’ with simulation which use constructivist at higher level (Kafai and Resnick, 1996). Gagne (1985) has defined 9 general steps of instruction for learning. These events of instruction are necessary to promote the internal process of learning in any platform. Therefore, we decided to make full use nine steps of Gagne’s principles which already established in 2D courseware. We have created 3 sections (table 4.3), which comprise of objectives section (gain attention, describe the goal, provides guidance for learning), tutorial section (presentation materials to be learned, elicit performance) and quiz section (stimulate recall of prior knowledge, provide feedback, enhance retention and learning transfer, assess performance). In reaching the goal, some healthcare learning materials (episiotomy and dementia) were chosen by chance which we considered suitable to test on health students., Table 4.3 below shows the multisection of OTQ framework which derived and related to the 9 Gagne's principles.

Table 4.3: Multisection of OTQ framework derived from 9 Gagnes's principles

Gagne's principles	Section
1. Gain attention	Objective
2. Describe the goal	Objective
3. Stimulate recall of prior knowledge	Quiz
4. Present materials to be learned	Tutorial
5. Provide guidance for learning	Objective
6. Elicit performance	Tutorial
7. Provide feedback	Quiz
8. Assess performance	Quiz
9. Enhance retention and learning transfer	Quiz

4.5.1 Learning Material

Two health lessons (table 4.4) that were chosen as initial learning materials are the causes of dementia and episiotomy techniques. Causes of dementia lesson (appendix A4) involves several tutorial topics such as an introduction causes of dementia, Alzheimer's disease, Vascular dementia, dementia with Lewy bodies, Fronto-temporal dementia, Creutzfeldt-Jakob disease, Aids-related cognitive impairment, mild cognitive impairment and rarer causes of dementia. Meanwhile, the episiotomy techniques lesson (appendix A3) involves an introduction of episiotomy and perineal tear, three stages of episiotomies (safe methods of performing episiotomies skill, episiotomy and perineal repair when suturing into vagina skills and perineal repair procedures on cutting an episiotomy, continuous perineal suturing and suturing of deep muscle layer skills). Table 4.4 below shows the topics of the two lessons used in this first experiment.

Table 4.4: Lessons used in the first experiment which act as formative evaluation

Introduction of dementia	Episiotomy techniques
Introduction	Introduction
9 common causes of dementia	Suturing techniques
	Repair of episiotomy
	Second degree tear

4.5.2 Second Life Program Technicality

In the creation of Virtual World learning course program, we used the Second Life program as learning platform and Linden scripting, Power Point, paint program and Gmail. Second Life (SL) is a virtual world developed by Linden Lab that launched on June 23, 2003, and is accessible on the Internet. Second Life is a free client program called the Viewer enables its users, called Residents, to interact with each other through avatars.The Second Life Program requires certain requirements which are more likely a minimum game requirement (Kelt, Oct, 2008). Linden scripting was used in creating the simulation and a quiz.

4.5.3 Multi Section

4.5.3.1 Objective Section

The first section of the Virtual World courseware is the objective, which was given at the beginning of the exploration. The objective section (figure 4.2) is the important part of the module which contains the goals that the health student needs to understand and accomplish throughout the training and learning session. The objective section given in several ways such as maps to explore to complete the mission, the topics to understand and tasks need to accomplished. Figure 4.2 below shows an example of screenshot which related to objective section.

Figure 4.2 shows map and instructions of journey need to be taken during the learning as objective section

These are several instructions [(figure 4.3) signs of places, objective boards, maps, exit and enter signs, direction signs] that were given in the objective section of the Virtual World courseware program. Figure 4.3 below show examples of instruction screenshot.

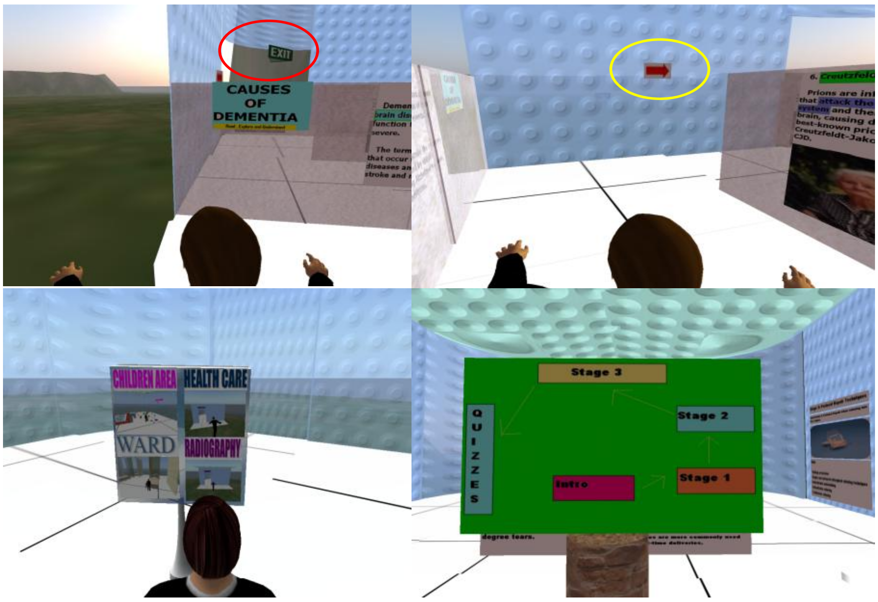


Figure 4.3 shows sample of screenshots of instruction given through the learning process

4.5.3.2 Tutorial and Enhancement Section

The tutorial part was created for presenting the syllabus of the subject . Different environment were created for different subjects. The lab space for teaching the common causes of dementia is shown in figure 4.4.

Figure 4.4 shows dementia tutorial

The tutorial lab for episiotomy teaching and training is shown in figure 4.5. This lab provides tutorial for steps in making episiotomy. The health students may learn and understand how to perform the episiotomy by reading and going through each step.

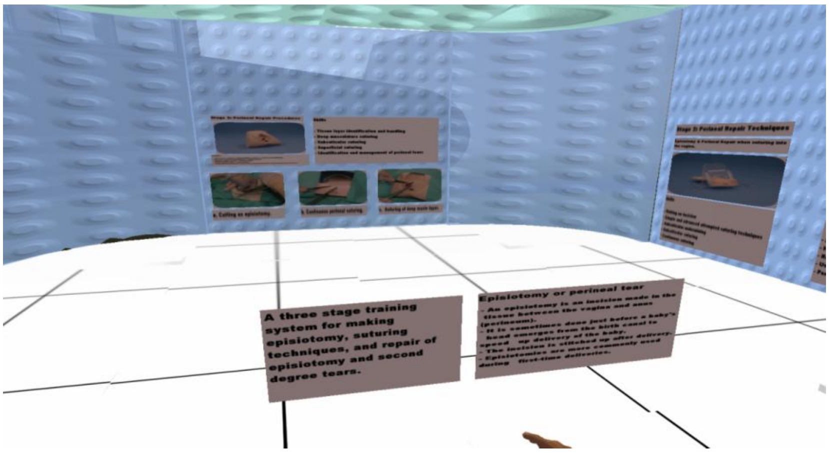
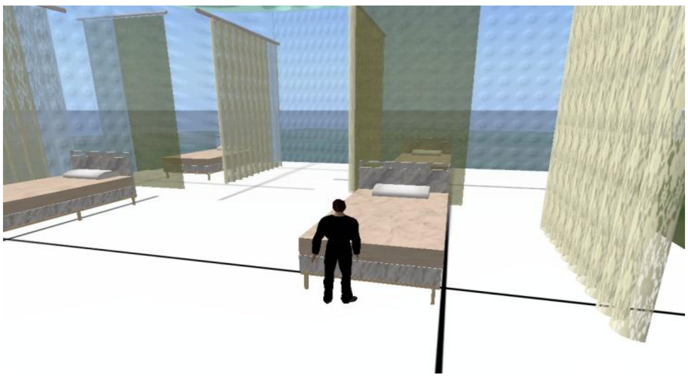


Figure 4.5 shows episiotomy environment

The tutorial section also provide hospital learning experience (figures 4.6 and 4.7) which include includes simulation, game like and training activities. These are to train by experience how the information should be used in real life. Training activities through Virtual World would create a safer environment and can be repeated compare to real life. Repetition training would enhance student knowledge.



Figures 4.6 experienced environment in the Virtual World

In the figure 4.7 below, the students may run the domino and play, the chair can be sit and make discussion, the ball can be kicked, the water and sound can be hear and so on.

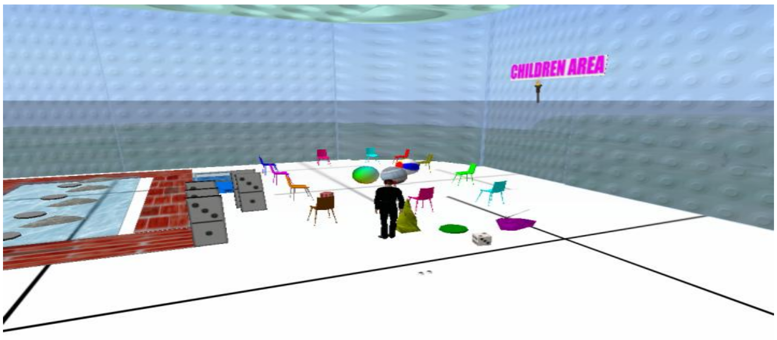


Figure 4.7 shows the simulated environment in the Virtual World

4.5.3.3 Quiz Section

Quizzes were given to test the memory and understanding of the student after each tutorial. Quizzes (appendix A5 and appendix A6) would tell the student whether their answers correct or wrong directly and correct the understanding of the student directly before the information goes to their long term memory. Figure 4.8 shows the example of quizzes given in Virtual World courseware.

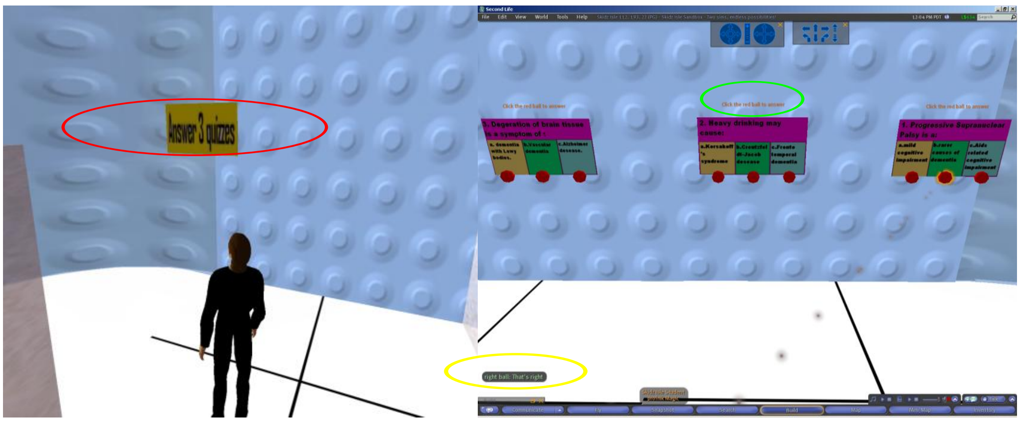


Figure 4.8 shows sample Quizzes design in the virtual world

These were several instructions given to the student go through the quizzes part.

a) Instruction to answer the quizzes

"Answer the quizzes"

This is the instruction for health student to answer the quizzes, so the student knows that he or she can answer the quizzes inside the program.

b) Instruction how to answer the quizzes

"Click the red ball to answer "

This instruction is to explain how to answer the quizzes, so the student may know that he or she had to click any of the balls to make an answer.

c) Instruction of wrong answer

"That's wrong"

This instruction is to tell the student that he or she had made a wrong answer.

d) Instruction of right answer

"That's' right"

This instruction is to tell the student that he or she had made a correct answer.

4.6 Sample

About 21 students from various health studies (forensic, sport science, nursing) were chosen to take the test. All of the participants did not have the knowledge of Virtual World program before. The dementia and episiotomy Virtual World prototype were prepared as the core of the experiment while the questionnaires (appendix A7) were given after the participant has done the test. The students were given instruction and guidelines before they took the experiment. The students were taking the test separately (one by one) and no other student allowed to view the program while the other students finish taking the test. Health School at Malaysia University of Science Kelantan branch were chosen as testing place. The experiment was done on September 2008 whereby the student in the middle of their studying semester.

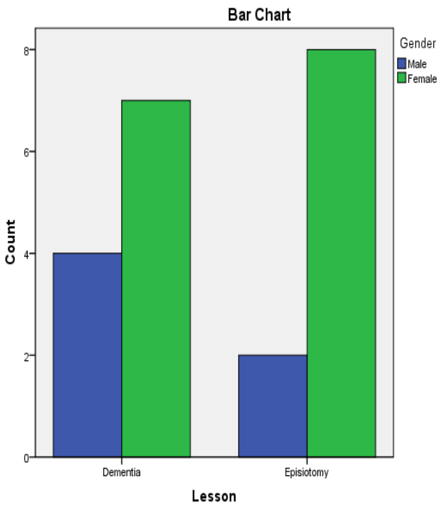
4.7 Testing Procedure

An experiment was done by letting the student go through the learning session and answer the questionnaires. Since all of the students don't have experience with Second Life, the students were given around 3 to 5 minutes to familiarize with the system before they start the learning session. During the learning session, the students had to know the objectives of the learning, learn the tutorial through explorative experience (appendix A1 and appendix A2), and answered the quizzes (appendix A5 and appendix A6). After the student had completed the learning through Virtual Worlds, they were given questionnaires to describe their perception about that courseware learning program.

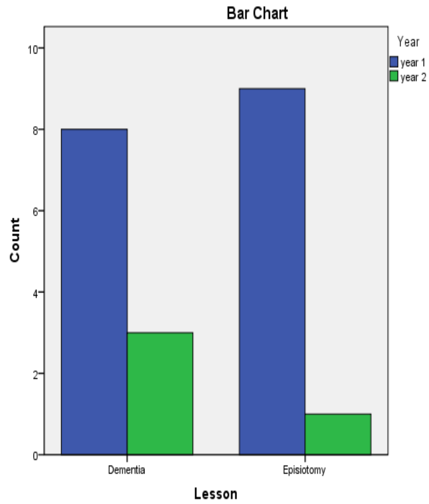
Laurillard's suggested that evaluation program should contain pre-program design (curriculum and learning needs), prototyping, formative evaluation, piloting and summative evaluation (Draper, 1996). This initial experiment was a pilot evaluation. The evaluations of this experiment were gathered through both the test and questionnaires. The quiz had 3 questions while the questionnaires had 3 demography questions, 11 close ended questions and 1 open ended question. Thao and Qunyh (1997) suggested that questionnaire of the courseware needs to evaluate certain points such as usefulness, interface design and learner friendly. Both close ended questions and quizzes aimed to evaluate the usefulness and interface design of this courseware, which the open ended question specifically aimed to collect overall perception and enhancement (learner friendly) towards further Virtual World courseware development.

4.8 Users Profiling

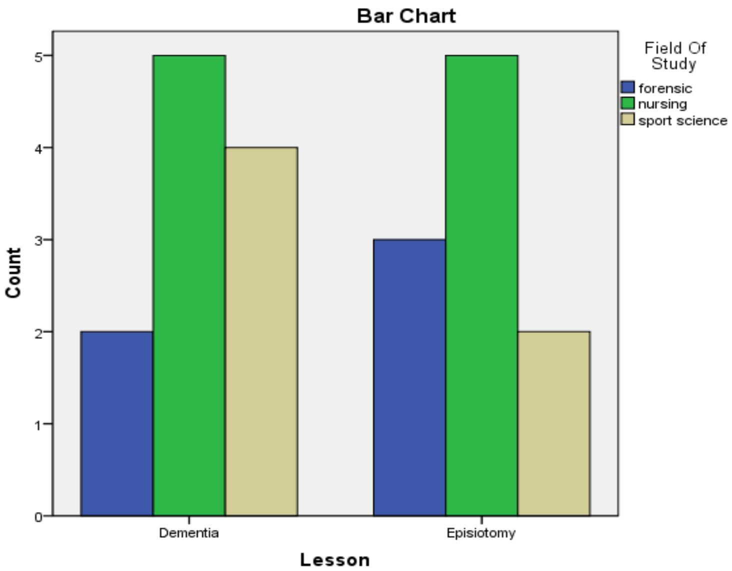
The test sample consisted of 21 users participated in the experiment on an individual basis. All of them were volunteers and first-time users of the experimental platform. The users also had no knowledge about the subject of dementia and episiotomy. Figure 4.9 shows users profiling in terms of personal data. As shown in figure 4.8b, most of the participants (81%) were from the year 1 and the remaining (19%) were from the year 2. The users' gender was observed at 71.4% (15 users) female and 28.6% (6 users) male. The largest percentages (47.6%) of the users were enrolled in a nursing course, the middle percentage (28.6 %) of the users was enrolled in sport science course and the minority of users (23.8%) were students in the forensic course. Figure 4.9 (a-c) below shows the profile of users in terms of personal data (gender, year and field of study).



(a)



(b)



(c)

Figure 4.9 shows the profile of users in terms of personal data (gender, year and field of study)

4.9 Results and Analysis

The obtained experimental results were analyzed in terms of different parameters including users' views regarding the presented 3D Virtual World courseware (VWC). These parameters involved measures of the users' performance (effectiveness), perceptions (ease of use, efficacy, and aesthetic) and satisfaction. The existence of statistically significant difference in users' responses was examined by the nonparametric Chi-square and statistical test at α() = 0.05 indicating a statistically significant difference when ρ-value (the probability of obtaining a test statistics as the one was actually observed) was found to be less than 0.05. The t-test can compares the actual difference between two means in relation to the variation in the data (expressed as the standard deviation of the difference between the means. The Chi - square test was used for statistical analysis of categorical data. It is used to test differences between means. Statistically significant may reveal either the observation result reflect a pattern than just a chance.

4.9.1 Effectiveness (Users' performance)

Table 4.5 below shows the statistical result of the first hypothesis and figure 4.10 shows the overall frequency of users' correct answers**.**

Table 4.5 shows the statistical result of the 1^{st} hypothesis.

Hypothesis 1	**Result**
Average correct answer of correctness to the required quiz questions.	The average correct answer of post quiz question was 73%.

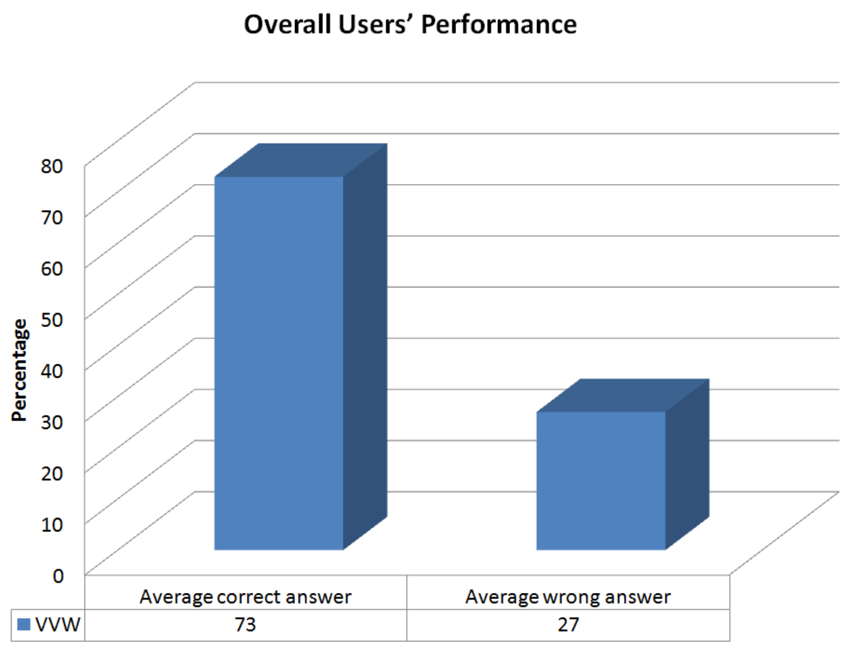


Figure 4.10 shows the overall frequency of users' correct answers

The results shown in the table 4.5 and figure 4.10 demonstrated that the users gain 73% in term of average correct answers. Each user was required to answer 3 questions from each lesson given. The total number of questions was 63 (21 user * 3 questions per user). Since the average correction was 73%, therefore it can be said that, 46 out of 63 questions were correctly answered.

On the whole, it can be said that the VWC used could contribute to users' performance in most of the required questions even though to a large extent, the design of the required questions did not permit clear impression about the role played by each of section in assisting VWC users (explained further in Chapter 5). Figure 4.11 shows the percentage of correct and incorrect answers achieved by users for both lessons.

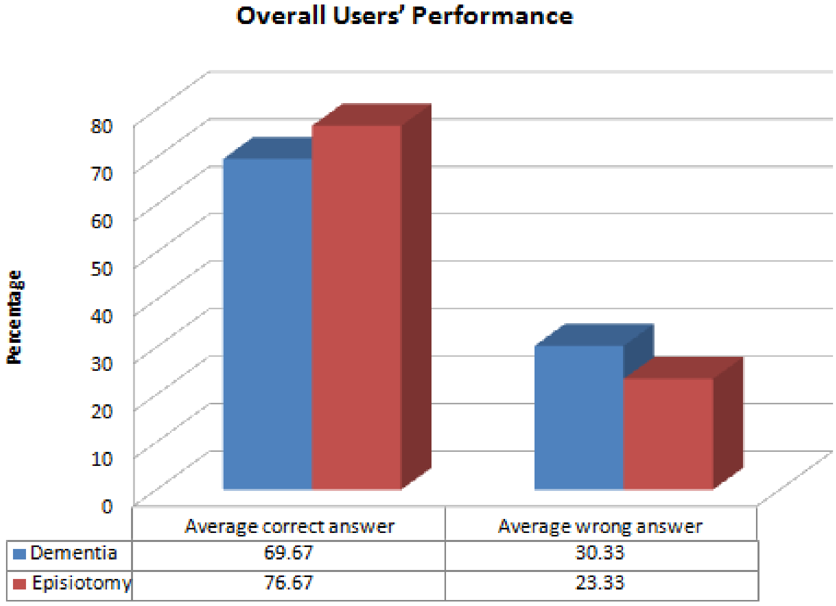


Figure 4.11: Average correct and incorrect answers by different lesson

Table 4.6 shows Chi square results for correctness of the lesson.

Lesson	χ^2 value	p-value	Significant
Dementia	22 (df= 4, CV= 9.49)	< 0.05	Yes
Episiotomy techniques	10 (df= 1, CV= 3.84)	< 0.05	Yes

It can be observed in figure 4.11 that dementia lesson users answered 69.67% questions correctly and 30.3% of users answered questions incorrectly. Meanwhile, it also can be seen that, episiotomy lesson' users accomplished 76.67% of correct answers and 23.33% of incorrect answers. Although users performed better on episiotomy tasks, the table 4.6 shows that the difference between correct and incorrect answers was statistically significant in both lesson types. Figure 4.12 shows overall percentage of users' correct answers in both healthcare lessons (episiotomy and dementia) and figure 4.13 shows users' correct answer (U1-U11-dementia and U12-U21-episiotomy) by each user.

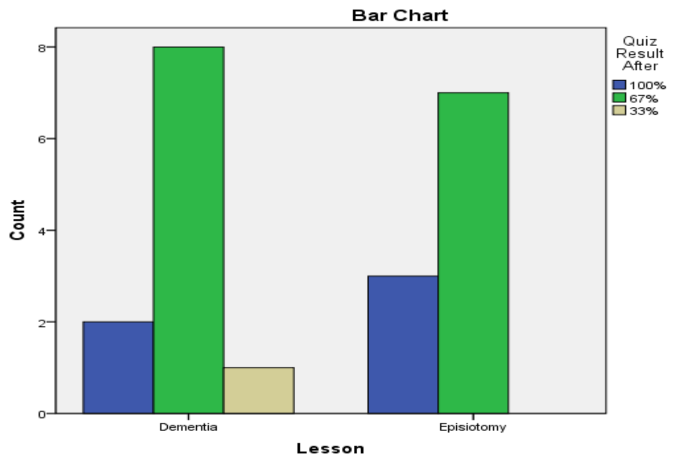


Figure 4.12: Overall frequency of users' correct answers

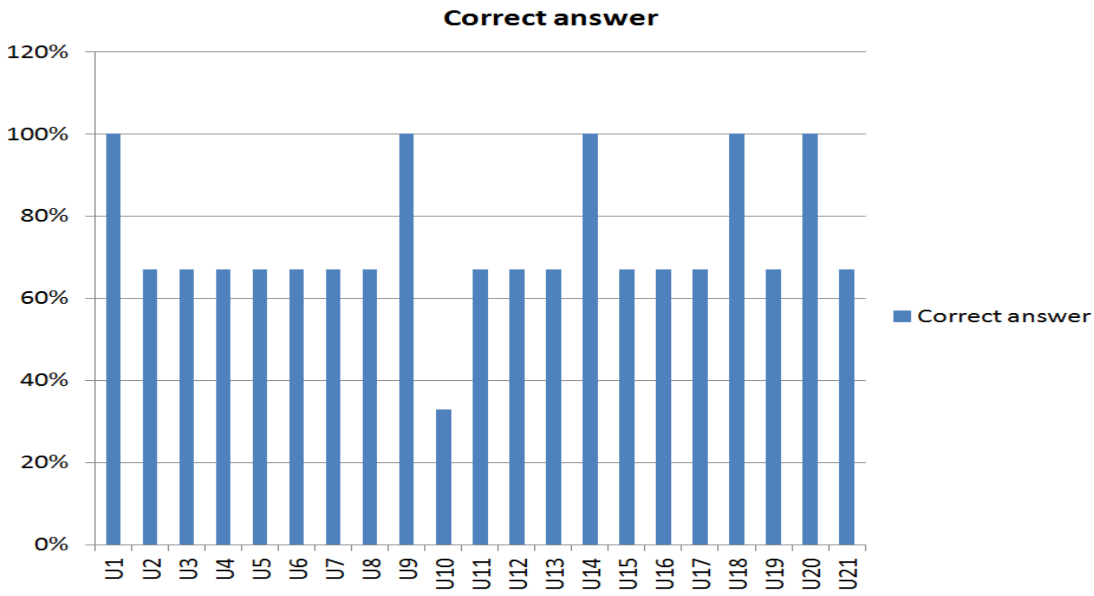


Figure 4.13: Users' correct answer (U1-U11-dementia and U12-U21-episiotomy) by each user.

It can be observed in figure 4.13 that two users from dementia group answered all questions successfully whereas three users from episiotomy group accomplished all correct answers. However, majority users provided accurate responses to two out of three questions. In other words, 95.24% (20 out of 21) users correctly performed two questions and above, which could be regarded as high performance rate. To summarize, it can be said that the 3D presentation through the Virtual World courseware was found to be usable in teaching health lesson. Figure 4.14 shows the number of correct answers provided by each user.

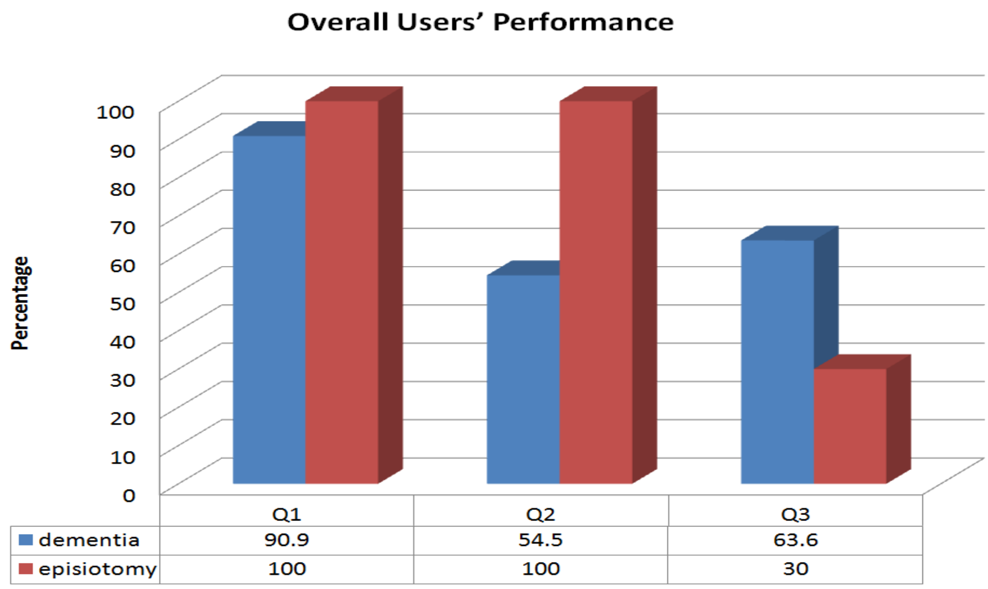


Figure 4.14 shows the number of correct answers provided by each user.

It can be seen in figure 4.14 that users' performance was varied across these questions. More specifically, the percentage of dementia users who correctly answered question 1 until 3, were 90.9% (10 users), 54.5% (6 users) and 63.6% (7 users) respectively. Meanwhile, the percentage of episiotomy users who correctly answered question 1 until 3, were 100% (10 users), 100% (10 users) and 30% (3 users) respectively. However, it seems that the remaining question 2 of dementia lesson and question 3 of episiotomy lesson were more difficult to answer.

These results were statistically statistically significantin terms of the difference between correct and incorrect answers to all questions in dementia lesson Q1 (χ^2 (1) =11, CV= 3.84, $p< 0.05$), Q2 (χ^2 (1) =11, CV= 3.84, $p< 0.05$) and Q3 (χ^2 (1) = 5, CV= 3.84, $p< 0.05$). These results were also statistically significant in terms of the difference between correct and incorrect answers for question 3 for episiotomy lesson group [Q3 (χ^2 (1) = 10, CV= 3.84, p< 0.05)] while no measures were taken for Q1 and Q2 since no wrong answer collected.

As a result, presentation in a 3D Virtual World could help in enhancing learners' performance in responding to different lessons and questions. More details about the correctness of users' answers to the learning evaluation questions can be found in Appendix A8.

4.9.2 Perceptions

In the experimental task, users were required to respond to perception questionnaire (3 statements) each of which had a 3-point Likert scale with scale-3 representing most agreements, scale-2 representing moderate agreement and scale-1 representing disagreement. The 3 statements were used to obtain users' attitude towards the different aspects of the VWC and also to obtain feedback from users regarding their learning experience attained during the interaction with the tested online learning platform. Table 4.7 shows the statistical result of the second hypothesis.

Table 4.7 shows the statistical result of the 2nd hypothesis.

Hypothesis 2	Result
The VWC will be express statistically statistically significantof positive views of both lesson groups.	The mean usefulness perception score of the dementia lesson group was (71.42%) and (72.78%) for the episiotomy lesson group.

4.9.2.1 Ease of Use

Figure 4.15 below shows the ease of use perception of VWC for both lessons (episiotomy and dementia) and table (4.8 and 4.9) below shows the mean and standard deviation for ease of use perception towards both lessons. Meanwhile, table 5.10 shows the t-test result of ease of use pecception for both lessons.

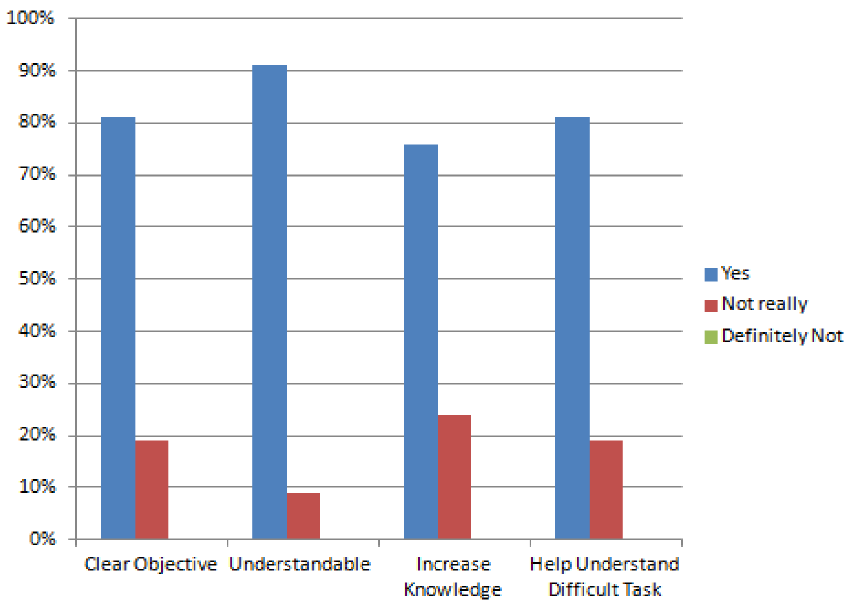


Figure 4.15 shows the ease of use perception of VWC in each lesson.

Table 4.8 shows Dementia lesson mean and standard deviation of ease of use

Question	Mean	Std Dev
Q1	2.82 (94%)	0.405
Q2	2.91 (97%)	0.302
Q3	2.82 (94%)	0.405
Q4	2.82 (94%)	0.405
Overall	**2.84 (94.75%)**	

Table 4.9 shows Episiotomy lesson and standard deviation of ease of use

Variable	Mean	Std Dev
Q1	2.8 (93.33%)	0.422
Q2	2.9 (96.67%)	0.316
Q3	2.7 (90%)	0.483
Q4	2.8 (93.33%)	0.422
Overall	**2.8 (93.33%)**	

Table 4.10 shows t test results with mean ease of use perception difference of VWC between both lessons.

	Critical Value (two tail)	t
Q1	2.093	1.525
Q2		2.441
Q3		20.455
Q4		3.704

As shown in tables 4.8 and 4.9, the overall mean ease of use perception score of the users in the dementia lesson group were 2.84 (94.75%) compared to an episiotomy lesson group which was 2.8 (93.33%). The t-test calculations (table 4.10) showed that the overall difference in positive ease of use perception between both lesson groups was all statistically significant (t (19) = [Q2=2.441, Q3=20.455 & Q4=3.704], CV=2.048, ρ <0.05) except for Q1 which was (t (19) =1.525, CV=2.048, ρ >0.05). It can be seen that the user views in term of ease of use perception of VWC were positive for both health lesson.

It can be noticed in figure 4.15, that users' statements of ease of use questionnaire attained high levels of user agreement which were 94% (Q1), 97% (Q2) , 94% (Q3) and 94% (Q4). Therefore, it can be said that the majority of users found that the learning with VWC interface had a clear objective, easy to understand, could increase knowledge and help in understanding difficult task.

4.9.2.2 Efficacy

Figure 4.16 below shows the efficacy perception of VWC for both lessons (episiotomy and dementia) and table (4.11 and 4.12) below shows the mean and standard deviation for ease of use perception towards both lessons. Meanwhile, table 5.13 shows the t-test result of efficacy pecception for both lessons.

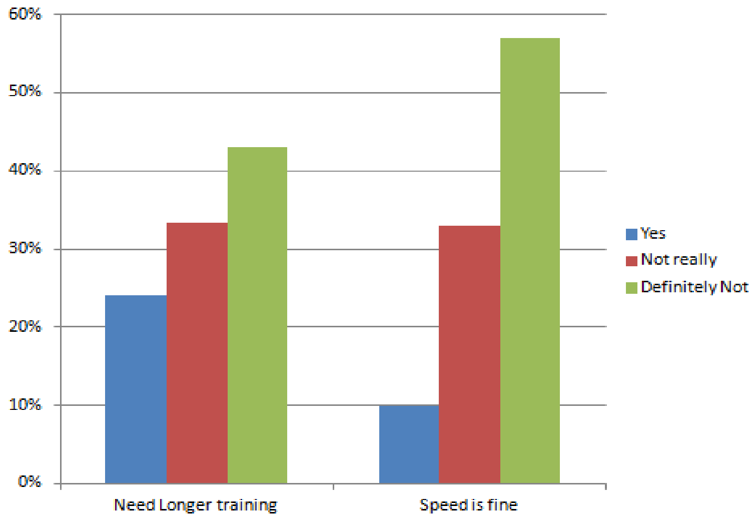


Figure 4.16 shows the efficacy perception of VWC in each lesson.

As shown in tables 4.11 and 4.12, the overall mean efficacy perception score for the users in the dementia lesson group were 1.54 (51.33%) compared to an episiotomy lesson group which was 1.65 (55%). The t-test calculations showed that the overall difference in efficacy perception between both lesson groups was both statistically significant (t (19) = [Q1=6. 696, & Q2=4. 951], CV=2. 048, ρ <0.05).

Table 4.11 shows Dementia lesson mean and standard deviation of efficacy

Variable	Mean	Std Dev
Q1	1.54 (51.51%)	0.874
Q2	1.54 (51.51%)	0.688
Overall	**1.54 (51.33%)**	

Table 4.12 shows Episiotomy lesson and standard deviation of efficacy

Variable	Mean	Std Dev
Q1	1.8 (60%)	0.789
Q2	1.5 (50%)	0.707
Overall	**1.65 (55%)**	

Table 4.13 shows t test results with mean ease of use perception difference of VWC between both lessons.

	Critical Value (two tail)	t
Q1	2.093	6.696
Q2		4.951

It can be noticed in figure 4.16 that users' the statements of efficacy perception questionnaire attained average levels of the user agreement for Q1 and high level of disagreement for Q2. Therefore, it can be said that the majority of users found that the learning with VWC interface was no need longer training but need higher Internet running speed.

4.9.2.3 Aesthetic

Figure 4.17 below shows the aesthetic perception of VWC for both lessons (episiotomy and dementia) and table (4.14 and 4.15) below shows the mean and standard deviation for ease of use perception towards both lessons. Meanwhile, table 5.16 shows the t-test result of aesthetic perception for both lessons.

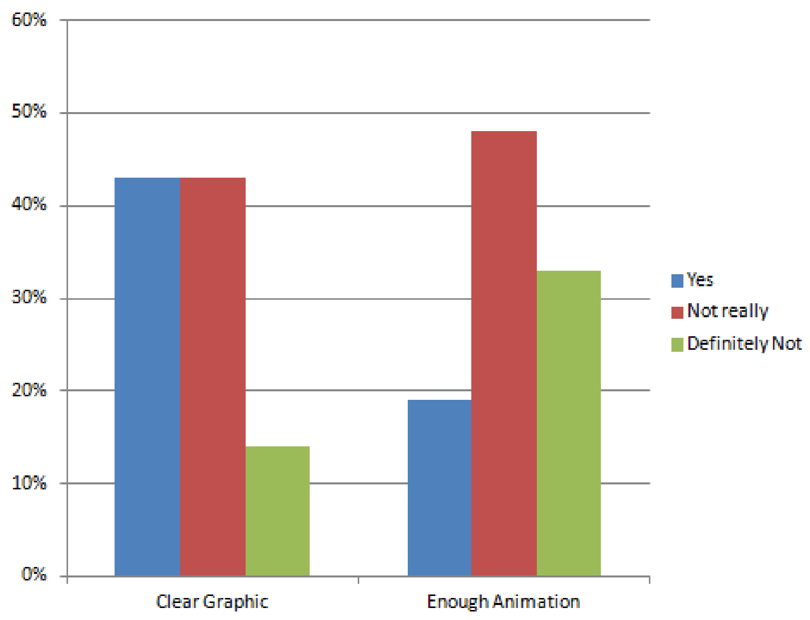


Figure 4.17 shows the aesthetic perception of VWC in each lesson.

It can be noticed in Figure 4.17 that users' the statements of aesthetic perception questionnaire attained below the average of the user agreement for Q1 and below the average of disagreement for Q2. Therefore, it can be said that the majority of users found that the learning with VWC interface contains unclear graphic and need more 3D animation.

Table 4.14 shows Dementia lesson mean and standard deviation of aesthetic

Variable	Mean	Std Dev
Q1	2.27 (75.67%)	0.786
Q2	1.82 (60.67%)	0.751
Overall	**2.05 (68.17%)**	

Table 4.15 shows Episiotomy lesson and standard deviation of aesthetic

Variable	Mean	Std Dev
Q1	2.3 (76.67%)	0.675
Q2	1.9 (63.33%)	0.738
Overall	**2.1 (70%)**	

Table 4.16 shows t test results with mean aesthetic perception difference of VWC between both lessons.

	Critical Value (two tail)	t
Q1	2.093	3.136
Q2		8.181

As shown in Figure 4.14 and 4.15, the overall mean aesthetic perception score for the users in the dementia lesson group was 2.05 (68.17%) compared to an episiotomy lesson group which was2. 1 (70%). The t-test calculations showed that the overall difference in efficacy perception between both lesson groups was both statistically significant (t (19) = [Q1=3. 136, & Q2=8. 181], CV=2. 048, ρ <0.05).

On average, user perception score calculated was 94.04% (table 4.8 and 4.9) for ease of use, 53.17% (table 4.11 and 4.12) for efficacy and 69.09% (table 4.14 and 4.15) for aesthetic indicating above the average positive attitude. Therefore, it can be said that an overall, all users in the of both health lesson groups of thought that the Virtual World Courseware was usable and to improve the 3D animation and movement speed.

4.9.3 Satisfaction

Upon finishing experimental task, users were required to respond on the overall satisfaction questionnaire composed of 3 statements each of which had a 3-point Likert scale with scale 3 representing most agreements, 2 representing moderate agreement and 1 representing disagreement. The 3 statements were used to obtain users' attitude towards the different aspects of the VWC and also to obtain feedback from users regarding their learning experience attained during the interaction with the tested online learning platform. Table 4.17 shows the statistical result of the third hypothesis and figure 4.18 shows users satisfaction of Virtual World Courseware experience.

Table 4.17 shows the statistical result of the 3rd hypothesis.

Hypothesis 3	Result
For overall, users will be satisfied with VWC.	User satisfaction score calculated was 88.35%.

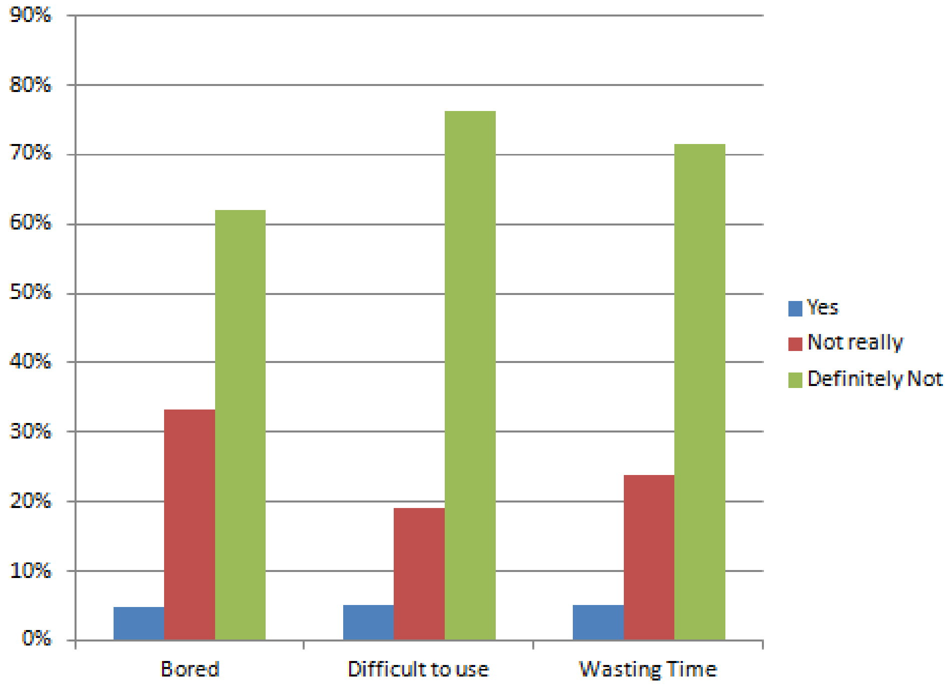


Figure 4.18 shows users satisfaction of VWC experience.

On average, user satisfaction score calculated was 88.35% indicating a high positive attitude. Table 4.18 shows users agreement and disagreement frequency of satisfaction statements.

Table 4.18 shows users agreement and disagreement frequency of satisfaction statements.

Statements	Agree (frequency)	Not really (frequency)	Disagree (frequency)
Bored	1	7	13
Difficult to use	1	4	16
Wasting time	1	5	15

The 3 statements were used to obtain users' attitude towards the different aspects of the VWC and also to obtain feedback from users regarding their learning experience attained during the interaction with the tested online learning platform. On average, user satisfaction score calculated was 88.35% indicating a high positive attitude.

The users' responses (i.e. agrees, moderately agree, disagree) to each statement in the satisfaction questionnaire is illustrated in figure and table 4.18 (see also Appendix A8). It can be noticed in table 4.18 that users' the negative statements of satisfaction questionnaire (question no. 5, 6 and 7) attained high levels of users' disagreement which were 89% (bored), 90.33% (difficult to use) and 85.71% (wasting time). Therefore, it can be said that the majority of users found that the learning with VWC interface was not bored, not wasting the time and not difficult to use.

4.9.4 Recommendations for further developments

An open question was given to gather overall suggestions and recommendations. Tables 4.19 and 4.20 shows the result of the main suggestions from health students towards the system program. 52.4% of users give opinions while another 47.6% not giving any opinion at all. The 3D objects and instructions became the first suggestion followed by module and sound. Animation and simulation also need an attention in the future development (would be included in the tutorial section).

Table 4.19 shows the result of the 4th hypothesis.

Hypothesis 4	**Result**
User comment and suggestions for further development.	Users suggest 3D health objects, instructional design, audio and simulation.

Table 4.20 shows the comments on the experimental presentation.

Overall Comments

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	design more 3D objects	3	14.3	27.3	27.3
	put more signs and directions	3	14.3	27.3	54.5
	put more difficult task and equipments	1	4.8	9.1	63.6
	put more interesting topic	2	9.5	18.2	81.8
	put more sounds	2	9.5	18.2	100.0
	Total	11	52.4	100.0	
Missing	System	10	47.6		
Total		21	100.0		

4.10 Discussion

As overall, 21 health students make several suggestions on technical, environmental and the instructional part of the system. These are other suggestions from the open ended question. Figure 4.19 shows the graph of student comments and suggestion categories.

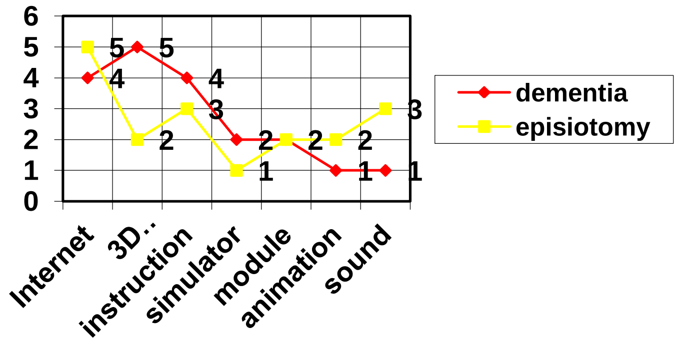


Figure 4.19 shows student suggestions

The results shown in table 4.19 defined that the users make comment and suggestions towards several elements such as internet connection, 3D health objects, instructional matters, simulator, module chosen, animation and sound. In terms of technical, the internet connection should be improved. In terms of design, the 3D and the instructional design should be improved. Other suggestions are the introduce new health care module and adding more animation and sound.

This chapter investigated the usability (user performance and perception) of health care courseware in 3D Virtual Worlds online environment and collecting suggestions for enhancement of micro (instructional) and macro (technical) level (Chen, 2006) for further development (experiment two and three).

Overall, the courseware in Virtual World is defined as useful in term of time consuming, user interface; add understanding compared with reading material and ease of use. From the quiz section, we also can conclude the courseware can also beneficial in tracking the student performance. Meanwhile, the open-ended questionnaire exposed that the healthcare course in Second Life using objective, tutorial and quiz sections could gives several advantages , such as clear user interface, informative, easy to remember, safe, alternative source and easy to understand compared to reading. From the close ended result, we also can conclude that the program lack of speed, 3D health elements and animation given. While from the open-ended result, we conclude that:

- The slow internet connection becomes the highest limitation
- The course should not be known or studied before.
- More instructional elements are required
- More simulation is requested
- High presence value is needed in a hospital environment
- The more comprehensive module is recommended
- More multimedia elements like sounds and animation is needed in the future courseware development

The close ended questionnaire (comments and suggestions) results had shown that, on a micro level, the new development should be added more 3D health object elements, simulation and animation environment and objects; increase the movement and adding more cognitive elements.

4.11 Summary

This chapter investigates the usefulness of the courseware framework created through Virtual World platform for self-directed, distance and online learning environment. The prototypes were developed by using episiotomy and dementia lesson module as a formative study for initial experiments. The development of Virtual World courseware utilized the multimedia learning system in enhancing satisfaction and cognitive factors which contains objective, tutorial and quiz sections. The experiment in this chapter used questionnaires and quizzes as instruments for evaluation. 21 health students from different courses at USM Kelantan have been used as testing participants. Table 4.21 shows the overall statistical result of the usability and the role of OTQ framework in Virtual World Courseware (VWC).

Table 4.21 shows the overall statistical result of the usability and the role of OTQ framework in Virtual World Courseware (VWC).

Usability of VWC	Statistical result
Positive perception of the required learning question in total.	The mean usefulness perception score of the dementia lesson group was (71.42%) and (72.78%) for the episiotomy lesson group.
Positive users' satisfaction will be satisfied with VWC.	User satisfaction score calculated was 88.35%.
Average correct answer of quiz questions in total will be more than two third. This means more than 68.57% in normal distribution.	The average correct answer of quiz question was 73%.
User comment and suggestions for further development	Users suggest fast internet connection, 3D health objects, instructional design, audio and simulation.

The result of this chapter had shown the usefulness of the Virtual World courseware in term of user performance, satisfaction and perceptions. The discussion had compute suggestions for further Virtual World courseware prototype development and experiment in term of technicality, instructional design, module, participants and testing locality. In the following chapter, this study discusses the further development of a Virtual World courseware framework which includes test section and video streaming. The suggestions for the discussion section in this chapter were also used in enhancing the effectiveness of the virtual world courseware.

However, results from this experiment did not give the role of each section provided in multisection (objectives, tutorial, quiz and test sections). Thus, in the following chapter, the role of each section is discussed further, with the additional of the test section (Chapter 5) and video segment (Chapter 6).

CHAPTER 5

EXPERIMENT II: An Empirical-Investigation of the Use and the Role of OTQT Framework in an Online 3D Virtual World Courseware II (VWC2)

5.1 Introduction

The first experiment had shown that developing courseware with multisection of OTQ (objective, tutorial and quiz sections) was usable but need an enhancement with instructional, 3D health objects elements and simulation. Ongoing assessment with careful instructional design is important when using emerging technologies (Mayrath, 2007) such as 3D Virtual World. Some reviews from the developed health care teaching in the Second Life platform such shown in the table 5.1, had shown that the current development did not clearly segregate and compile the section of objective, tutorial, quiz and test systematically. Therefore, in this experiment, 3D health objects element, more guided instruction and test section for performance result assessment tracking were added. The main difference between first and second experiment was the additional 3D health objects and test section added which shown in the figure 5.1. Therefore the second experiment was expected to enhance the prototype of healthcare course modules created in the 3D Virtual World courseware. This second experiment also aims to investigate the usability and the role of each section of OTQT (objective, tutorial, quiz and test) added in 3D Virtual Worlds online learning environment of VWC2 (Virtual World Courseware II) which the first experiment did not investigate. Figure 5.1 shows OTQT framework used for the second experiment

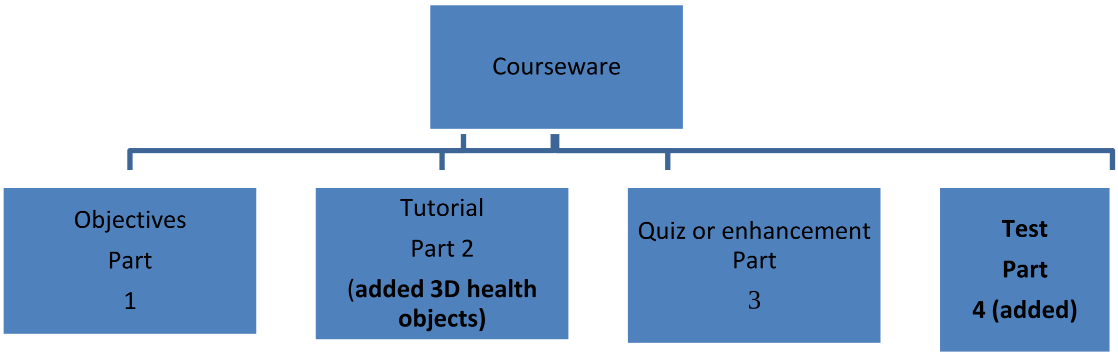


Figure 5.1: OTQT framework (with added 3D health objects and test section) used for the second experiment

This chapter describes an empirical exploration that has been carried out to investigate the comparison of usability aspects of the courseware interface between 2D and metaverse (Virtual World) in the framework of objective, tutorial, quiz and test sections. The suggestions in the first experiment were used in this presentation. The primary question is whether the Virtual World courseware with framework presentation can enhance the usability and user's learning performance in self-directed learning interface. The secondary question is related to the contributing role that each section could play in the expected enhancement. An online learning experimental platform, with two interface versions (2D and Virtual World) was developed to serve as a basis for this investigation. The subject module chosen for this experiment was alternative medicine (cupping). The study involved two groups of users (one group for each interface version) in which the usability performance of the two groups in term of perceptions, effectiveness and users' satisfaction was compared.

5.2 Aims, Objectives and Hypotheses

The aim of this experiment was to examine the impact or role of each four educational sections of the OTQT framework presentation (objective, tutorial, quiz, and test) on the online 3D Virtual World usability learning interface. It is also aimed at evaluating the extent to which the addition of these 4 sections could affect user's learning performance. More specifically, this experiment is aimed at testing the users' perception (ease of use, efficacy, aesthetic and presence) and users' satisfaction of Virtual World courseware interface as compared to standard 2-dimensional courseware which already well known and worldwide publisher. In general, this experiment is aimed at investigating the usability aspects of learning performance of the online learning interface that combines objective, tutorial, quiz and test sections in Virtual World courseware II (VWC2). In other words, this study is aimed at exploring if the presentation using this online 3D Virtual World courseware (Second Life) and the addition of OTQT framework would result in a significant enhancement in terms of perception and satisfaction.

In order to fulfil the aims mentioned in the previous section, the following objectives had to be considered:

1. Formulating the experimental hypotheses.

2. Developing two different versions of courseware as an experimental online learning platform to be used to carrying out this empirical investigation. The first version, 2-dimensional courseware (2DC) which follows instructional standards of Synergy Corporation Company was developed using Power Point and converted into a flash presentation. Meanwhile, the second version was first development of

the four section framework of Virtual World courseware (VWC2) offered explorative experience with 3-dimensional environment. Both coursewares used cupping lesson as subject module.

3. Testing the two experimental online learning platforms independently by two different groups of users.

4. Measuring the effectiveness of the tested platforms by calculating the percentage of tasks correctly answered by users. This measure was also used for users' learning performance.

5. Measuring user's satisfaction by their ratings for different aspects and learning experience with the tested platforms.

It was expected that the usability of a courseware in an online learning and the users' learning performance would be influenced by the experiential learning and presentation of online 3D Virtual World environment through four sections (objective, tutorial, quiz and test) framework of OTQT in VWC2 program. Therefore, the role of newly design multisection of OTQT in VWC2 was analyzed and compared with already established and standard instructional flash courseware in the market.

Accordingly, the following hypotheses have been derived and figure 5.2 shows the flowchart of second experiment plan.

H1: The VWC2 will express positive views similar to 2DC in terms of perception (ease of use, efficacy and aesthetic) in Objective Sections of the courseware.

H2: The VWC2 will express positive views similar to 2DC in term of perception (ease of use, efficacy and aesthetic) in Tutorial Sections of the courseware.

H3: The VWC2 will express positive views similar to 2DC in term of perception (ease of use, efficacy and aesthetic) in Quiz Section of the courseware.

H4: The VWC2 will express positive views similar to 2DC in term of perception (ease of use, efficacy and aesthetic) in the Test Section of the courseware.

H5: Users of VWC2 will express positive views towards the use of courseware in term of presence.

H6: Users of the VWC2 will perform as similar as 2DC users in term of correct answer percentage of the test result.

H7: Users of the VWC2 will about as satisfied as the 2DC users.

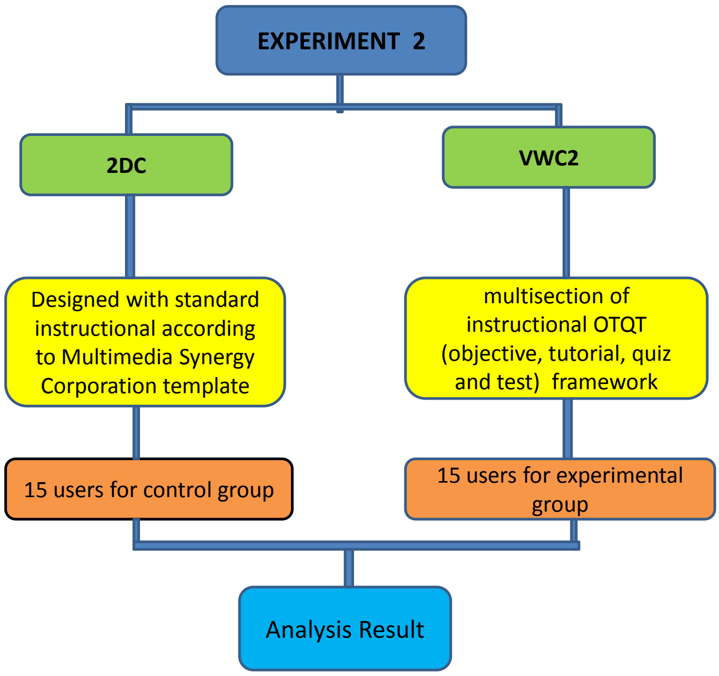


Figure 5.2: Flowchart of second experiment plan

This second experiment investigates the usability and the role of each section of OTQT (objective, tutorial, quiz and test) added in 3D Virtual Worlds online learning environment of VWC2 (Virtual World Courseware II). Two platforms (2DC and VWC2) were created and compared their learning performance and usability. 30 users (15 each) for both groups (control and experimental) were involved. The result of the role of each section was analysed according to ease of use, efficacy, aesthetic, and presence. The performance of both groups was analysed by test assessment.

5.3 Experimental Platform

The initial experiment in chapter 4 had present the template of a courseware presentation on Virtual World and the result has shown several amendments and suggestions towards courseware development in the Virtual World program. Therefore, two online learning platforms were developed especially to be used in conducting this empirical investigation. The courseware in Virtual World was main for the experimental group and the courseware in two-dimensional platform was main for the control group. The experimental courseware used Second Life as a platform while the control courseware used I-Spring (flash) as a platform. I-Spring is the software that can develop flash program from Power Point presentation for e-learning. Both interface versions were designed to deliver the same health lesson module which was cupping treatment. There was one section added in this experiment compared to the initial experiment from Chapter 4 which is the test section whereby both cupping treatment courseware in this Chapter 5, contain four main sections, which were objective, tutorial, quiz and test.

The initial experiment in chapter 5, however did not fully utilize the advantage in Virtual World program, such as 3 dimensional objects and simulation. Therefore, in this Chapter 4, we had combined all text, 2-dimensional graphics and 3-dimensional graphics in the tutorial section presentation. 2- Dimensional courseware in flash (2DC) used only texts and 2-dimension graphics, while Virtual World courseware (VWC2) used texts, 2-dimensional graphics and 3-dimension graphics in their presentation. Second Life as Virtual World platform also presents exploratory and experiential learning compared to I-Spring in flash program which present multimedia presentation. Overall, the difference of 2- Dimensional courseware (2DC) and Virtual World courseware (VWC2) can be shown in the table below 5.1 below:

Table 5.1: Courseware interface difference in 2D and Virtual World

Learning Presentation	**2D courseware**	**Virtual World courseware**
User Interface	Text, 2-dimension graphics,	Text, 2-dimension graphics, 3-dimension graphics
Lessons presentation	Lessons segregation through frames	Lessons segregation through land space
Navigational	Frames hyperlink	Walking, Running, teleporting and flying
Activities	Drag and drop with low simulated activities.	High simulation like gaming can be done in one activity
Learning to type	multimedia	explorative

The experiment in chapter 5 investigates the user perception on four section framework, user performance and satisfaction of the Virtual World (with 3-dimensional elements added in tutorial section) by comparing with 2-dimensional courseware (flash) which used Synergy Corporation instructional standard as a control group. The details of 2DC can be seen in Appendix B1 and the details of VWC2 can be seen in Appendix B2.

5.3.1 Learning Material

The result in chapter 4 had initiated several amendments in choosing of health subject. The lesson language was English since the experiment venue was done in the UK. The participants studying background were from a wide range of field (pure sciences, medicine, language, etc.). Therefore, the rationale of Cupping Treatment lesson subject was chosen to reduce the biased in term of the healthcare knowledge base of each participant (Hartman, 2008) which none of participant ever learns about Cupping Treatment before. In this experiment, the author had become the Subject Method Experts in Cupping Treatment where we had gained the knowledge and expertise from course and training before the development of this second experiment (Grützner, 2002).

The Cupping Treatment subject material was one set of short learning material about cupping treatment healthcare skill which is one type of alternative medicine subject. The author had gained the knowledge through classes and training in the United Kingdom from UK Hijama practitioner organization. Thus, the researcher has become the Subject Method Expert herself in designing the course module. The cupping treatment lesson titles comprised of types of cupping, cupping body parts, cupping equipment, cupping techniques, cupping benefits, cupping optimal times and preparation before and after cupping treatment. The lesson tutorial in 2-dimensional courseware presented with text and 2-dimensional graphic images with multimedia learning while the lesson tutorial in Virtual World courseware presented in text, 2D graphic images, 3D objects with simulation and explorative learning. Table 5.3 shows the courseware interface difference in 2DC and VWC.

Table 5.3: Courseware interface difference in 2DC and VWC

Interface	2DC	VWC2
Text	√	√
2D graphics	√	√
3D graphics		√
3D environment		√
Online	√	√

This cupping treatment lesson was arranged in the 4 sections platform (objective, tutorial, quizzes and test) in contributing to a courseware either in 2-dimensional (by frames) or Virtual World (by spaces).

5.3.2 Multi Section in Two-dimensional (Flash) Courseware (2DC)

The 2DC comprise of 7 topics of Cupping Treatment lesson module of the tutorial section, the test section and the review section. Each tutorial lesson has its own objective, topic and quiz. Lesson 1 titled types of cupping, lesson 2 titled cupping body parts, lesson 3 titled cupping equipment, lesson 4 titled cupping techniques, lesson 5 titled cupping benefits, lesson 6 titled cupping optimal times and lesson 7 titled preparation before and after cupping treatment. Figure 5.3 below shows the framework of 2DC courseware of an online learning interface and figure 5.4 (a-c) show examples of screenshot of the tutorial Cupping Treatment subject lesson of optimal body part for cupping treatment presented in 2DC.

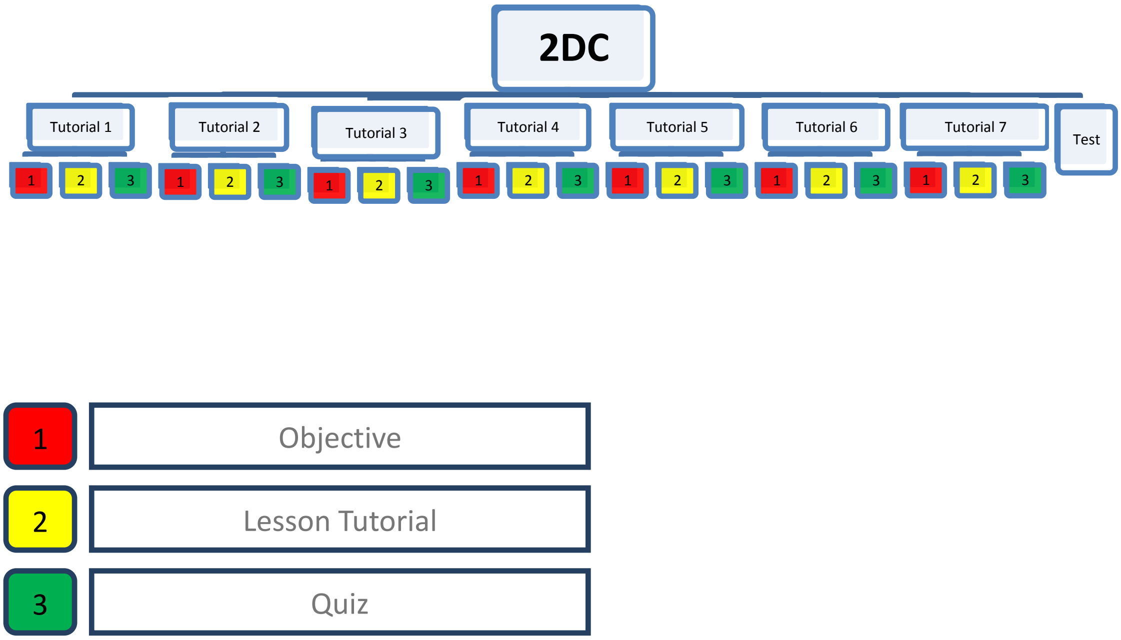
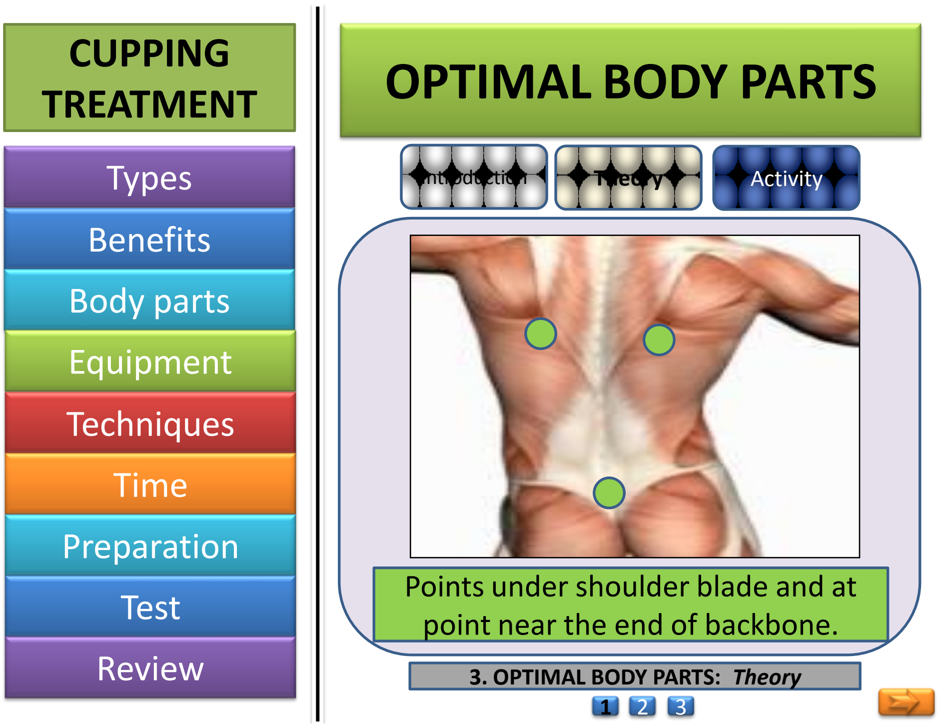
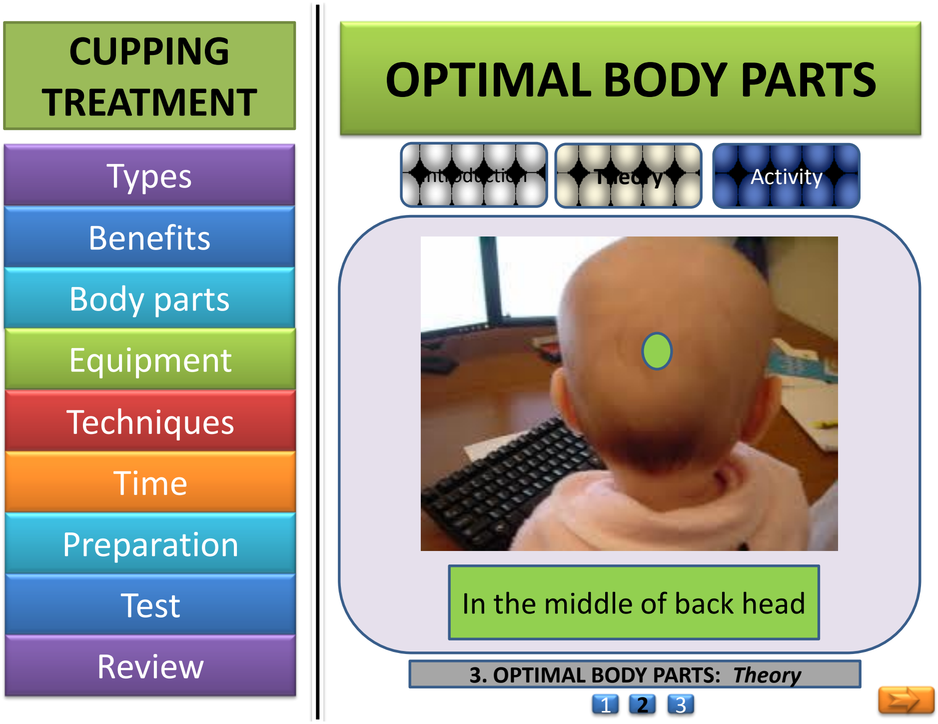


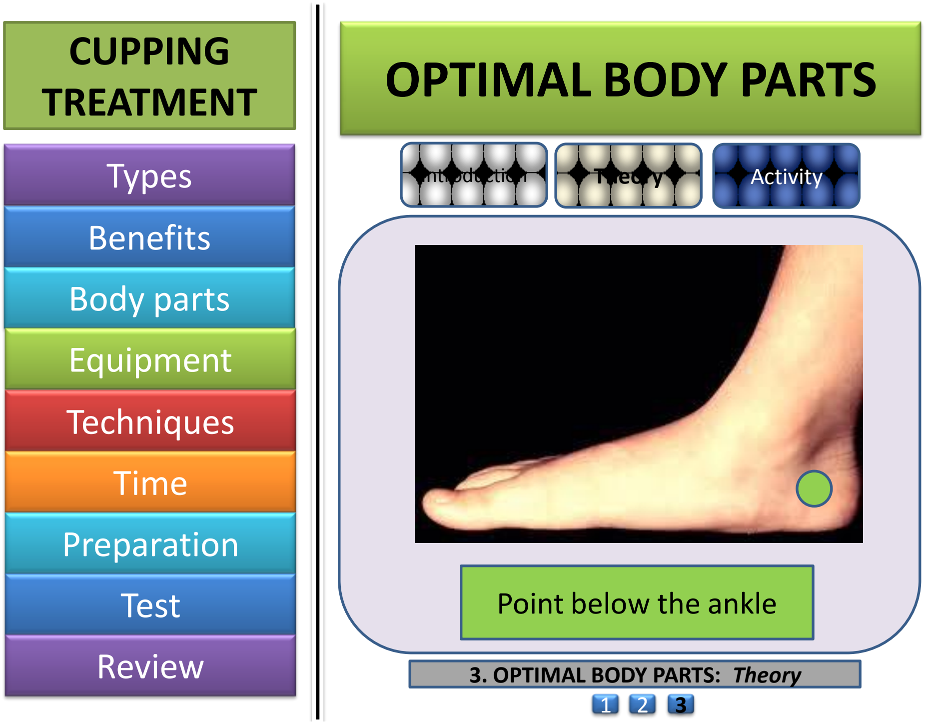
Figure 5.3: The framework of 2DC courseware



(a)



(b)



(c)

Figure 5.4 (a-c): Examples of screenshot of the tutorial Cupping Treatment subject lesson of optimal body part for cupping treatment presented in 2DC.

There were 7 different lessons provided in the Tutorial Section which has similar learning subject lesson to the one in online 3D Virtual World environment. Figures (5.5, 5.6 and 5.7) show examples of screenshot (objective, tutorial and quiz sections) in the 2DC interface.

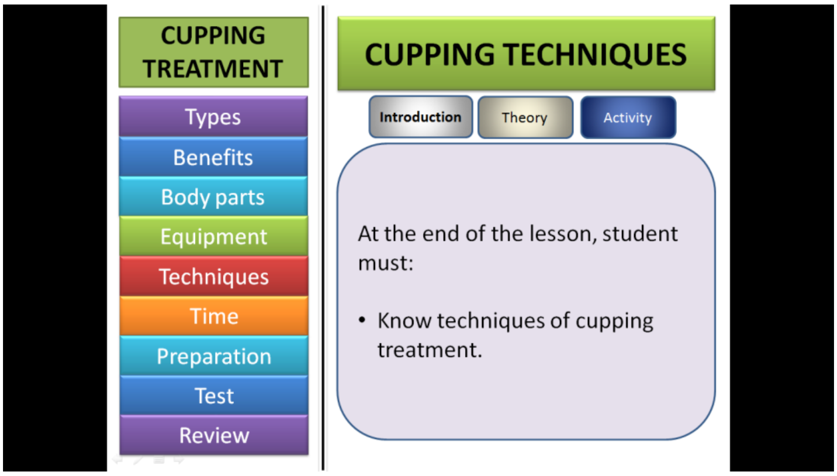


Figure 5.5: Screenshot 2DC Objective Section

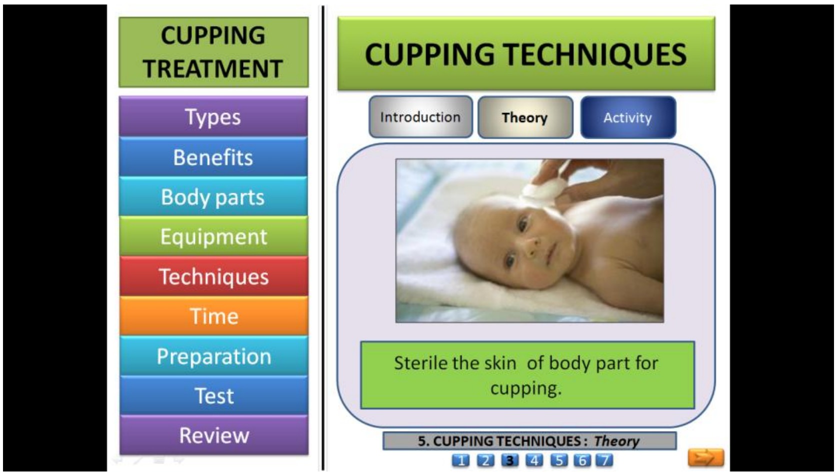


Figure 5.6: Screenshot 2DC Tutorial Section

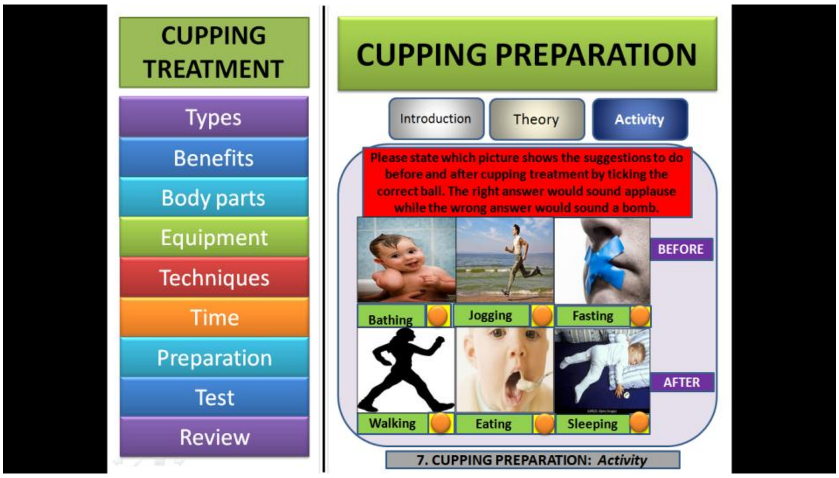


Figure 5.7: Screenshot 2DC Quiz Section

The left buttons (under the main tittle) show the Cupping Treatment title of all parts (lessons, test and review) in 2DC platform. The participant can click the left buttons on 2DC interface to learn about the subject. Each lesson contains objective, theory (content of the tutorial) and activity (quiz). Figures 5.8 and 5.9 show an example of a screenshot (test and review sections) in the 2DCW interface.

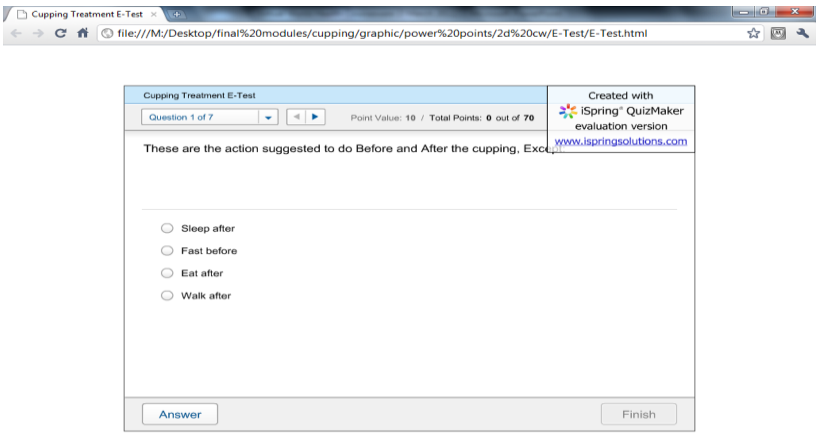


Figure 5.8: Screenshot in 2DC Test Section

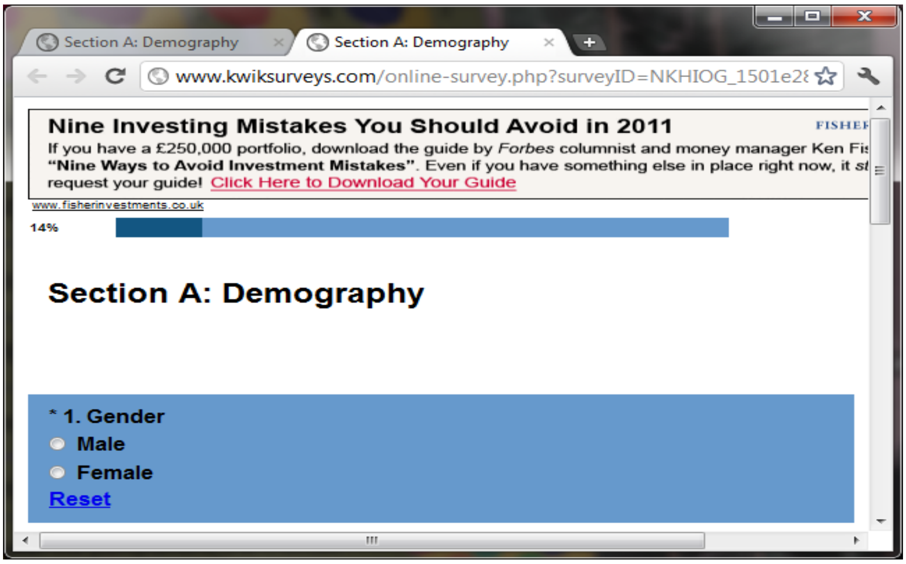


Figure 5.9: Screenshot in 2DC Review Section

The participant can click the test button to take the test and click the review button to answer the questionnaire. The test section comprises of 7 questions regards the 7 lessons from a tutorial given before while the review section is about the questionnaire (participant's opinion about the courseware).

5.3.3 Multi Section in Virtual World (Metaverse) Courseware II (VWC2)

The figure 5.10 shows the framework of VWC2 courseware of an online 3D learning interface. Even though, the presentation of framework VWC2 design is a little different with 2DC, but both of them use similar healthcare learning module of Cupping Treatment subjects.

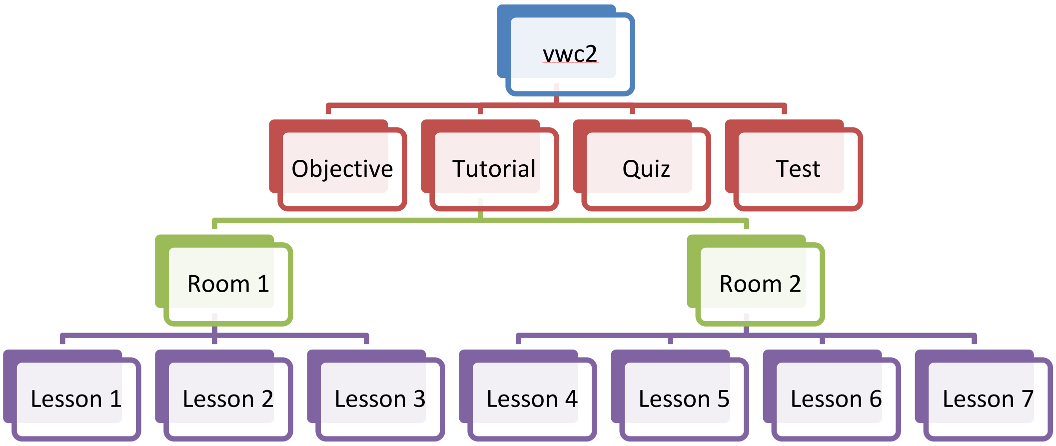


Figure 5.10: The framework of VWC2 courseware

The figure 5.11 below , shows an example of similar tutorial Cupping Treatment of cupping types presented in online 3D Virtual World environment. The VWC2 courseware has 4 main sections of objective, tutorial, quiz and test. The tutorial section has 2 rooms. The two rooms contain three (room 1) and four lessons (room 1) from 7 topics of Cupping Treatment module. Lesson 1 titled types of cupping, lesson 2 titled cupping body parts, lesson 3 titled cupping equipment, lesson 4 titled cupping techniques, lesson 5 titled cupping benefits, lesson 6 titled cupping optimal times and lesson 7 titled preparation before and after cupping treatment.

Figure 5.11: An example of screenshot of the tutorial Cupping Treatment subject lesson of cupping types presented in VWC2.

Figure 5.12 shows an example of a screenshot in an objective section in the VWC2 courseware in an online 3D learning interface. The objective given in the initial experiment of chapter 4 is shown in text only, while the objective given in this second experiment shows text with 2D graphics with 3D environment of the reception area. The instruction (follow the red arrow) is also given in this phase. 3D environment of the VWC2 was created using Linden scripting in Second Life platform while the 3D objects were created with Linden scripting and PloppSL.

Figure 5.12: Screenshot in VWC2 Objective Section

In the tutorial of this experiment, 3D objects were created for lesson learning as enhancements from the tutorial in the initial experiment of chapter 4. There were seven lessons of Cupping Treatment presented in the tutorial section of this second experiment compared to the initial experiment (3 lessons of Episiotomy and 3 lessons of Causes of Dementia). Lesson 1 (types of cupping) presents a body of aggressive cupping, head of air cupping and head of blood cupping. Lesson 2 (cupping techniques) presents 2D graphics and 3D step by step cupping techniques (blood cupping of the head). Lesson 3 (cupping benefits) presents 2D graphics and body parts (feet, head, anatomy) with the text of cupping benefits. Lesson 4 (cupping optimum time) presents 3D astronomy (earth, month and sun position) of cupping optimum time for lunar month. Lesson 5 (cupping optimum body parts) presents the 3D anatomy, foot and head with cupping optimum points at each of the body parts. Lesson 6 (cupping equipments) presents the showroom of blood cupping equipment. Lesson 7 (cupping preparation) presents the 3D graphics and environment of shower room, eating table, living room and bedroom. Additional slideshow of cupping technique also presented in the Room 2 of tutorial lesson. The students may experience the learning through exploration of each lesson through two rooms of tutorial section. Figures (5.13 and 5.14) show examples of screenshot in room 1 and room 2 of the VWC2 courseware in an online 3D learning interface.

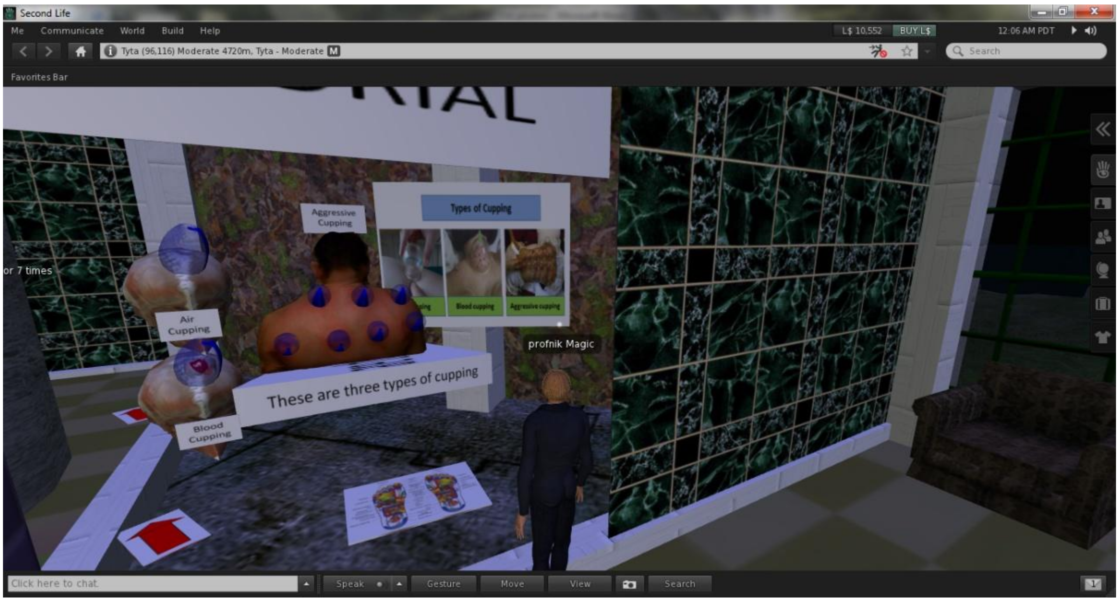


Figure 5.13: Screenshot in Room 1 of VWC2 Tutorial Section

Figure 5.14: Screenshot in Room 2 of VWC2 Tutorial Section

Assessment plays an integral role in teaching and learning which the content and character must be significantly improved and their information and insights should become part of the ongoing learning process (Sheppard, 2008). This is similar to a quiz session where, it has become part of a training and memory enhancement process. There were seven quizzes in this section. The quiz section in this second experiment (7 quizzes and 2D graphics) was upgraded from initial experiment which contain only three quizzes (from 3 lessons and no 2d graphics). The Quiz Section here is a room specifically for memory training. Numbered and simulated colors ball present as right or wrong answer. Instructions were given through red arrows, footsteps and overhead quiz. Figures 5.15 shows an example of a screenshot of a quiz section in the VWC2 3D online learning interface.

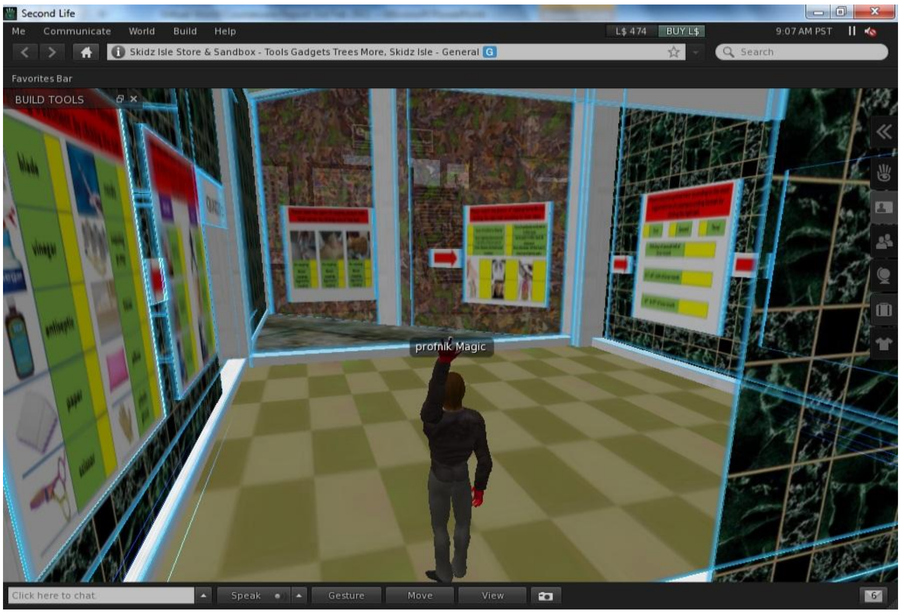


Figure 5.15: Screenshot in VWC2 Quiz Section

The test section contains seven questions regarding seven given lessons in the tutorial and quiz sections. This test section upgraded from initial experiment which contain three questions (from 3 lessons). 3D environment in the test section presents the test room for individuality. 3d objects in the test section combine test paper with chairs to sit and taking the test. Instructions were provided accordingly to help participant taking the test. Test simulation would present the test result directly to the email. Standard test and classroom assessment should be balanced (Stiggins, 1999). Here the test session is one kind of standard assessment in virtual world courseware which could check the performance of the student and recorded by the tutor or lecturer. The figure 5.16 below shows the screenshot of the test section in Virtual World courseware II (VWC2).

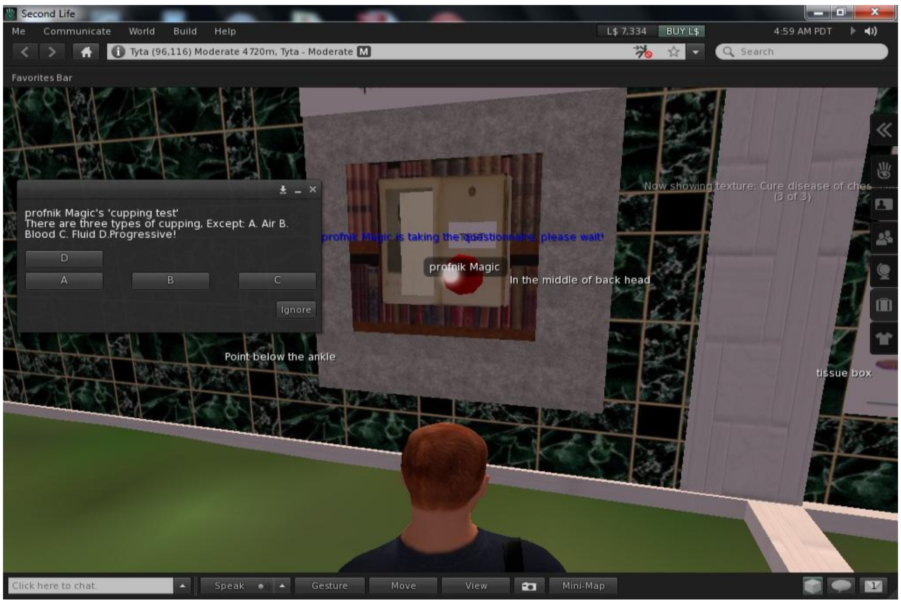


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Figure 5.16: Screenshot in VWC2 Test Section

5.4 Experimental Design

In order to explore the effect of Virtual Courseware II with OTQT framework and can this type of product match the two-dimensional courseware in terms of user perception, performance and satisfaction, both interface versions of experimental platform were developed. One group tested the two-dimensional courseware (2DC) which serves as a control and the other tested the Virtual World courseware II (VWC2) which serves as the experimental group. This design methodology, *within-subjects* testing, was using the same assignment of different users to test different experimental conditions and may guarantees controlling the learning effect (Field 2005). In total, 30 users participion (15 users each platform) were used to compute the results.

5.4.1 Procedure

In order to keep the consistency throughout the experiment, about similar procedure with two groups of users was followed. There were slight differences in lesson presentation between 2DC and VWC2. This can be seen in Table 5.3 and Table 5.4.

Table 5.3: Procedure followed in conducting the VWC of the second experiment

15 Users						
Pre-experimental questionnaire						
Tutorial for learning in Second Life						
Objective Section						
1	2	3	4	5	6	7
Tutorial Section						
1	2	3	4	5	6	7
Quiz Section						
1	2	3	4	5	6	7
Test Section						
1	2	3	4	5	6	7
Evaluation Questionnaire						
Satisfaction Questionnaire						

Table 5.4: Procedure followed in conducting the 2DC of the second experiment

15 Users		
Pre-experimental questionnaire		
Tutorial for learning in 2DC		
Lesson 1		
Objective 1	Tutorial 1	Quiz 1
Lesson 2		
Objective 2	Tutorial 2	Quiz 2
Lesson 3		
Objective 3	Objective 3	Quiz 3
Lesson 4		
Objective 4	Objective 4	Quiz 4
Lesson 5		
Objective 5	Objective 5	Quiz 5
Lesson 6		
Objective 6	Objective 6	Quiz 6
Lesson 7		
Objective 7	Objective 7	Quiz 7
Evaluation Questionnaire		
Satisfaction Questionnaire		

The experiment was started by reading the introduction to the questionnaire and answering the pre-experimental questions for users' profiling in terms of personal information such as age, gender and education level. Also, at this stage of the experiment, users were required to declare their previous experience with computers and Internet usage with ICT different learning presentation (web, PowerPoint, video, standalone, CDROMs, online 3D and Virtual World) familiarity. Then, the users of both groups have to go through the learning experience of Cupping Treatment lesson which contains Objective (7 objectives), Tutorial (7 lessons) and Quiz (7 quizzes) Section. In 2DC, the objectives and quizzes were given in each tutorial while in VWC2, the objectives, tutorial and quizzes were separated into sections. Afterwards, both groups have to answer 7 questions in Test Section which related to 7 lessons in Tutorial Section. After completing all four sections (OTQT), both users were asked to give their perceptions and satisfaction ratings about the different aspects of the tested interface version by answering the post-experimental part of the questionnaire. In order to control the learning effect, similar learning lesson module (cupping treatment) was presented to both groups. The questionnaire which has been used in conducting this experiment can be seen in Appendix B4.

5.4.2 Tasks

Both groups learned seven common lessons. These seven lessons were evenly associated with the four-section framework of objective, tutorial, quiz and test of OTQT. Table 5.5 summarizes the required four-section learning and seven common lessons.

Table 5.5 shows a summary of the required tasks in the second experiment.

Objective Section	**Tutorial Section**	**Quiz**	**Test**
Lesson 1	Tutorial 1	Quiz 1	Test 1
Lesson 2	Tutorial 2	Quiz 2	Test 2
Lesson 3	Tutorial 3	Quiz 3	Test 3
Lesson 4	Tutorial 4	Quiz 4	Test 4
Lesson 5	Tutorial 5	Quiz 5	Test 5
Lesson 6	Tutorial 6	Quiz 6	Test 6
Lesson 7	Tutorial 7	Quiz 7	Test 7

In completing each lesson, each user had to go through learning objective, tutorial and quiz. The quiz was meant for understanding, training and memory enhancement. Upon completion of three sections of objective, tutorial and quiz, each user was requested to answer 7 questions (appendix B3) about test section consisting of 2 easy, 2 moderate and 3 difficult. The aim of these questions was to evaluate the learning performance gained by users due to the information presented by the applied interface.

5.4.3 User Sampling

There are 30 (15 each group) users in both groups were used as user sampling which suppose to be sufficient for usability evaluation (Nielson). Also, too many users have not been involved due to time restriction of courseware (2DC and VWC2) development and investigation of research knowledge, procedure, testing, evaluation and documentation to obtain an overall impression and study feasibility. The samples were collected from the reply email from students who wish to be volunteers. The selection of the participants was based on their non-prior knowledge in the learning topic namely alternative health lesson module of Cupping Treatment. In this regard, the majority of the users in both groups had no experience indicating that they will rely only on the presented learning material to answer the required questions. The date and time then set for each of volunteer students. The figure 5.17 shows the sample of system interface used to capture result in this experiment.

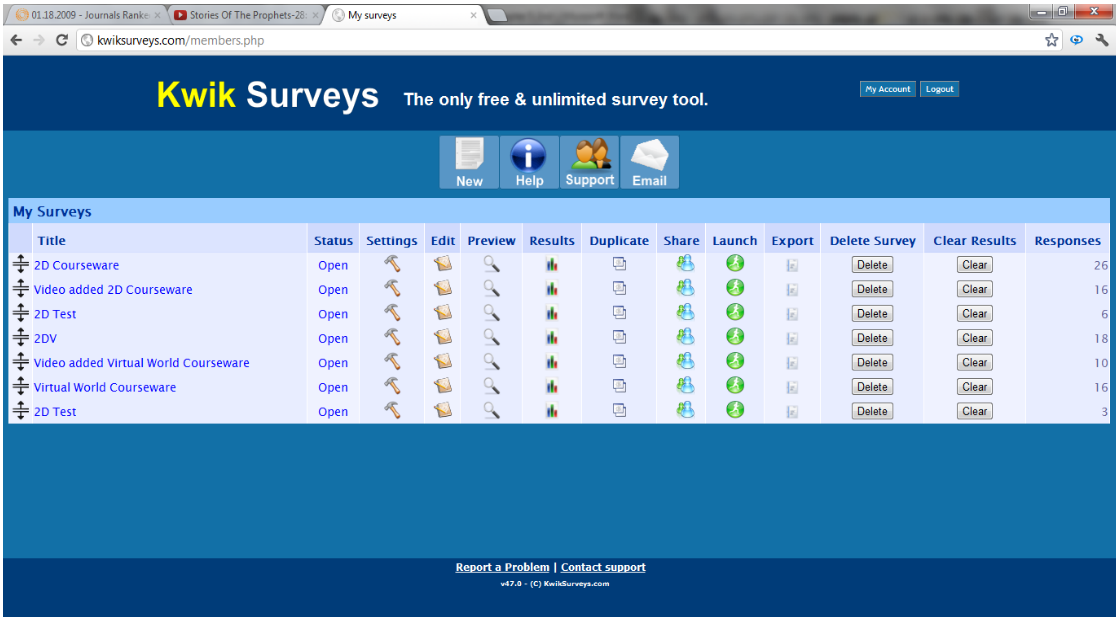


Figure 5.17: system interface used to capture result in this experiment

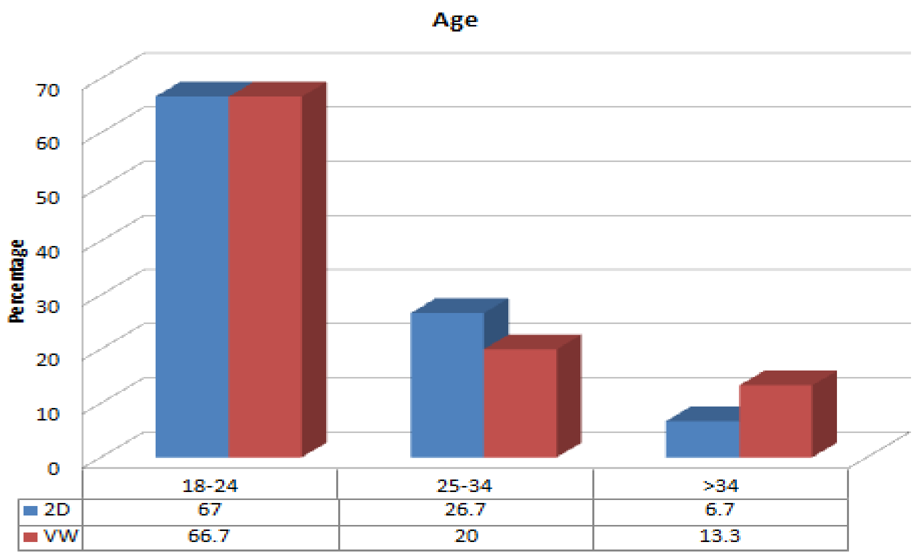
All 30 volunteers involved in this study were first-time users of the experimental platform and never learn about the subject (cupping treatment) before. They were randomly assigned to the experimental conditions; text with two-dimensional graphics with flash interface for the control group, and online 3D Virtual World of Second Life environment for the experimental group.

5.5 Data Collection

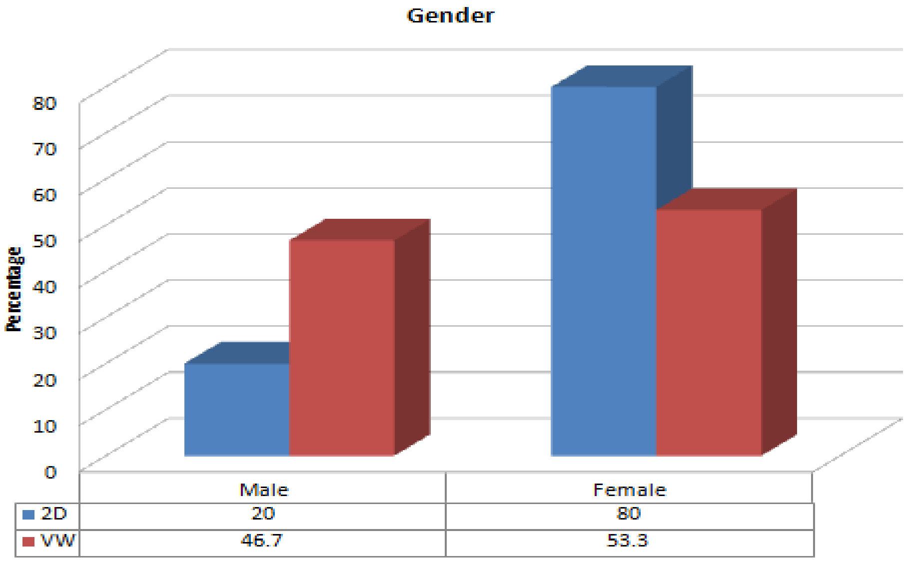
The data collection process was based on the experimental calculations and questionnaires (refer appendix B4). Upon completion of the self directed learning through an online platform, each user was required to answer the seven questions regarding the tutorial in the test section. The percentage of correct answers of the test (appendix B3) result were calculated by measuring the user performance. The data related to the courseware usability and perceptions (in term of efficacy, ease of use, aesthetic and presence) with the positive views were observed. The pre-experimental part of the questionnaire was dedicated to gathering personal data about users such as gender, age, education level, area of study and residence. It also helped to obtain data related to users' prior experience with computers, Internet, web, flash, Power Point, video technology, stands alone courseware, CD-ROMs 3D Games, online 3D Games and Virtual World program. Finally, the post-experimental part of the questionnaire was aimed at the assessing the users' satisfaction with the tested self-directed online learning platform. Users' responses to this questionnaire were used to calculate the satisfaction score for each user in both the control (2-dimensional courseware) and the experimental (Virtual World courseware) groups.

5.6 User Profiling

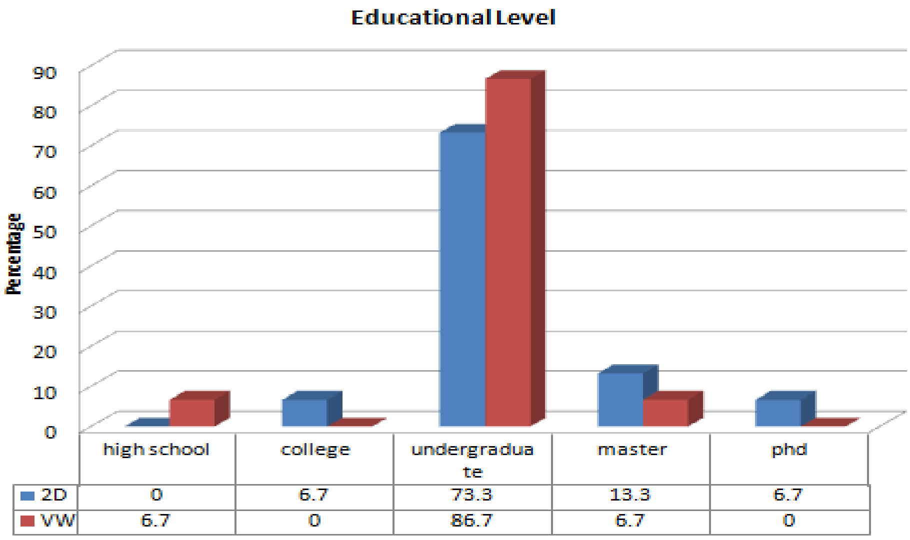
Figure 5.18 (a-d) shows the data in relation to users' personal and educational information as well as their previous knowledge and experience were collected and analysed on the basis of their responses to the pre-experimental questions (refer to Appendix B4).



(a)


Gender
Percentage
80
70
60
50
40
30
20
10
0
Male
Female
2D 20 80
VW 46.7 53.3

(b)


Educational Level
Percentage
90
80
70
60
50
40
30
20
10
0
high school
college
undergradua te
master
phd
2D 0 6.7 73.3 13.3 6.7
VW 6.7 0 86.7 6.7 0

(c)

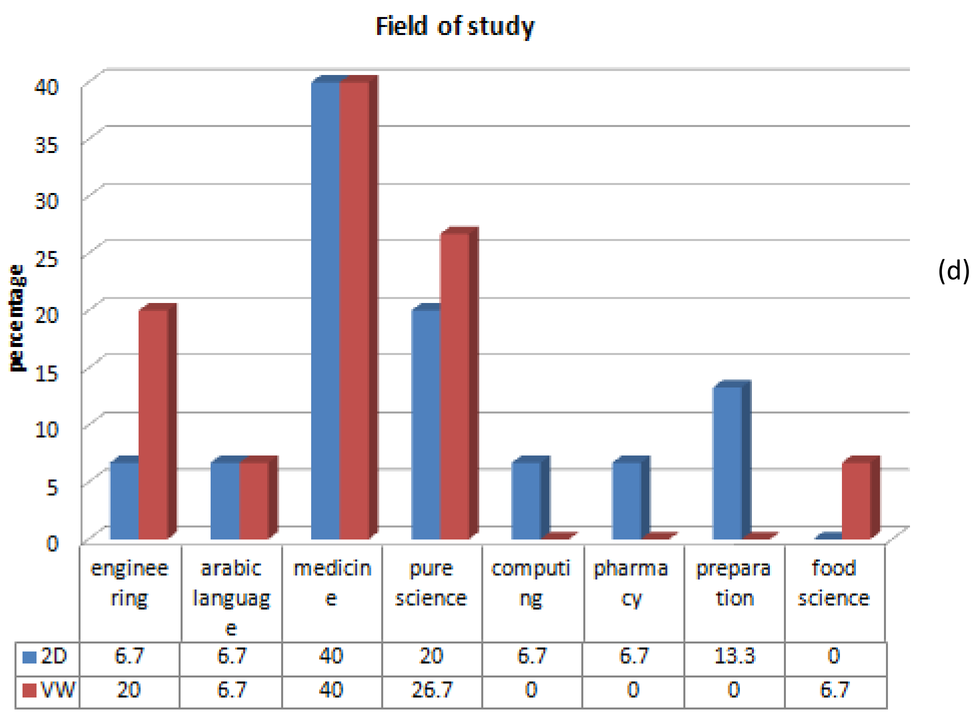
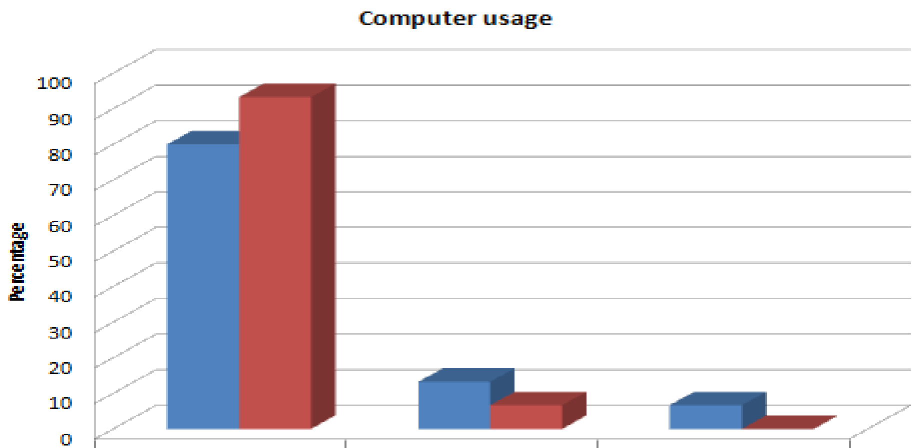


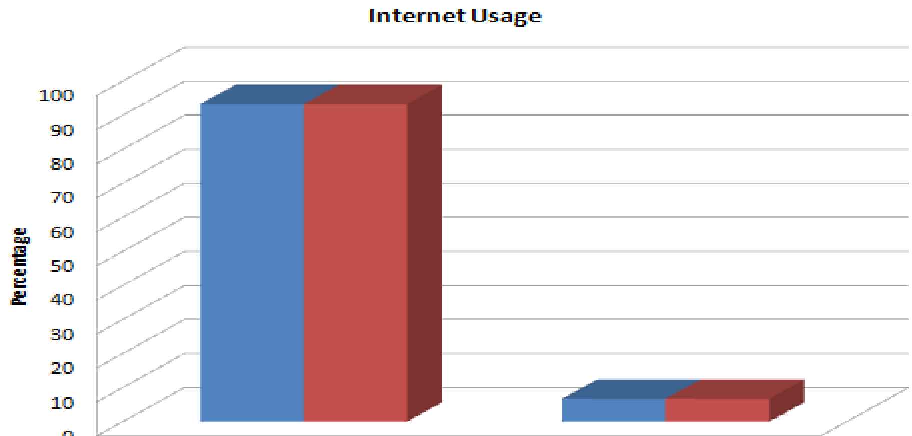
Figure 5.18: Users' profile in terms of age (a), gender (b), educational level (c) and area of study in both control and experimental groups.

Figure 5.18 (a) shows that the age range in the control group was about 67% within 18-24, 26.7% 25-34 and 6.7% (one user) more than 34 years old. In the experimental group, the ages were 66.7% within 18-24, 20% 25-34 and two users more than 34 years old. The majority of the participants (figure 5.18b) were female by 80% in the control group and 53.3% in the experimental one. The education level (figure 5.18c) was found to be predominantly by undergraduates which 73.3% (experimental) and 86.7% (control) while the others were postgraduates, high school and college. Additionally, the areas of study (figure 5.18d) for users in both groups were medicine, pure science and engineering. Below [figures 2.19 (a-h)] shown the user profiling (ICT knowledge and skills) of both control and experimental group.



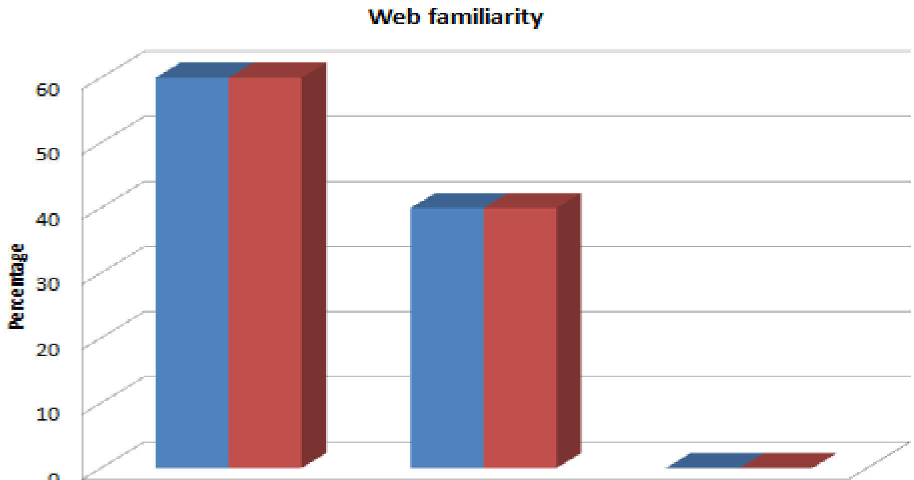
	more than 10 hours	6-10 hours	1-5 hours
2D	80	13.3	6.7
VW	93.3	6.7	0

(a)



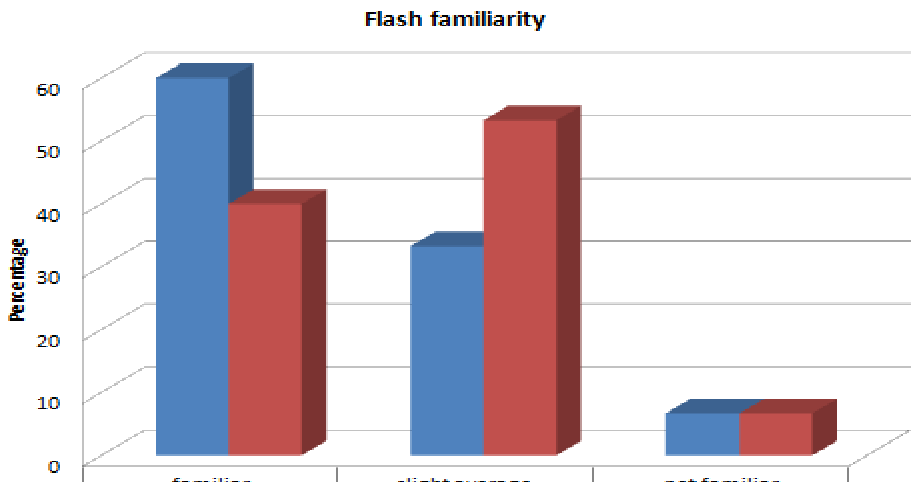
	more than 10 hours	6-10 hours
2D	93.3	6.7
VW	93.3	6.7

(b)



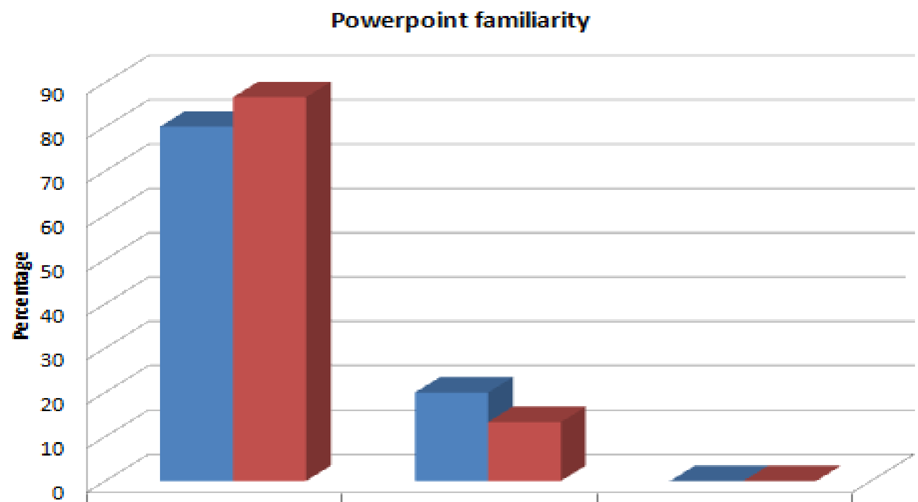
	familiar	slight average	not familiar
2D	60	40	0
VW	60	40	0

(c)



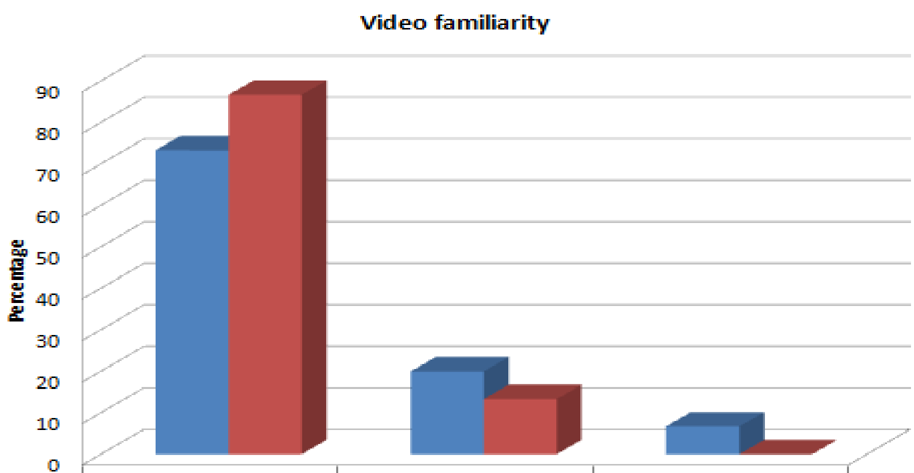
	familiar	slight average	not familiar
2D	60	33.3	6.7
VW	40	53.3	6.7

(d)



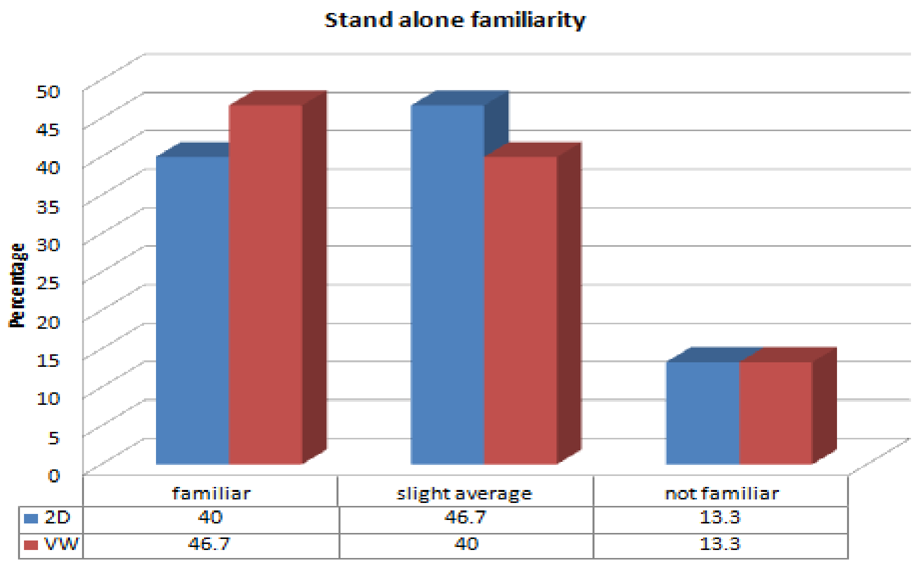
	familiar	slight average	not familiar
2D	80	20	0
VW	86.7	13.3	0

(e)



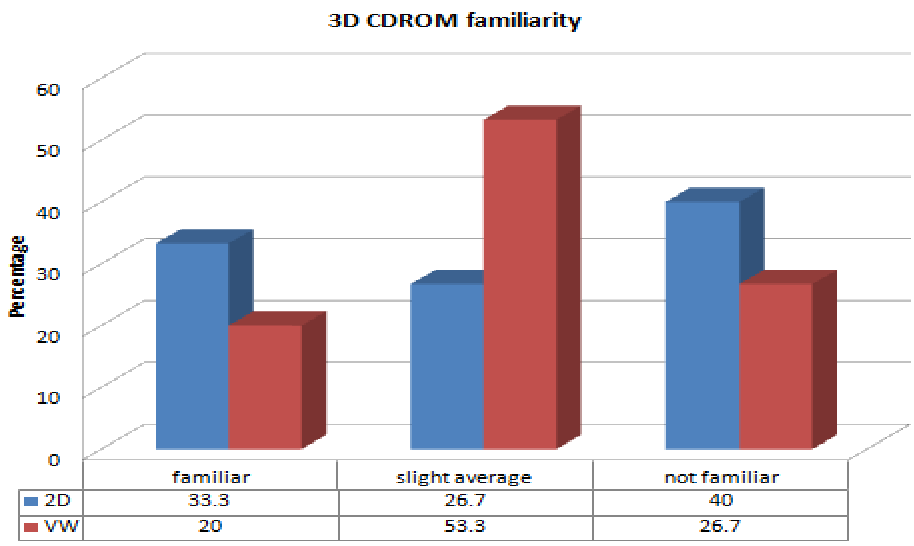
	familiar	slight average	not familiar
2D	73.3	20	6.7
VW	86.7	13.3	0

(f)



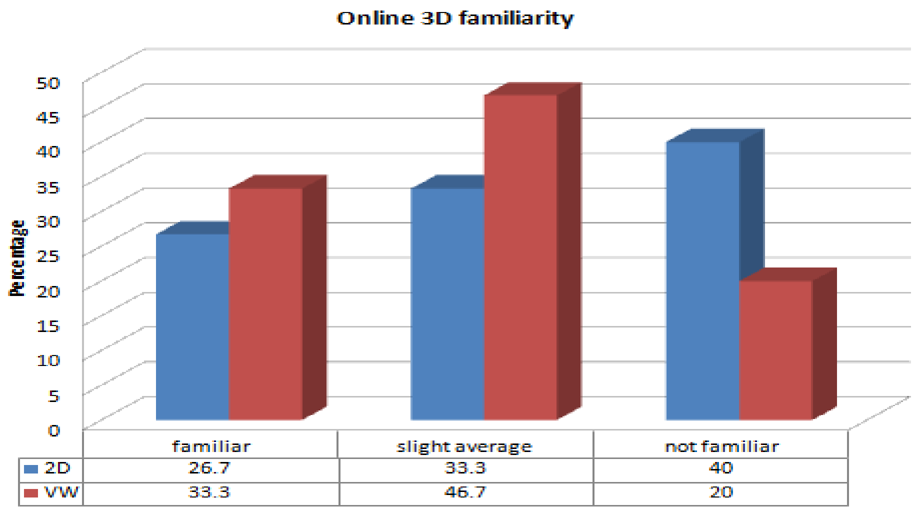
Stand alone familiarity
Percentage
0 5 10 15 20 25 30 35 40 45 50
familiar | slight average | not familiar
2D 40 46.7 13.3
VW 46.7 40 13.3

(g)



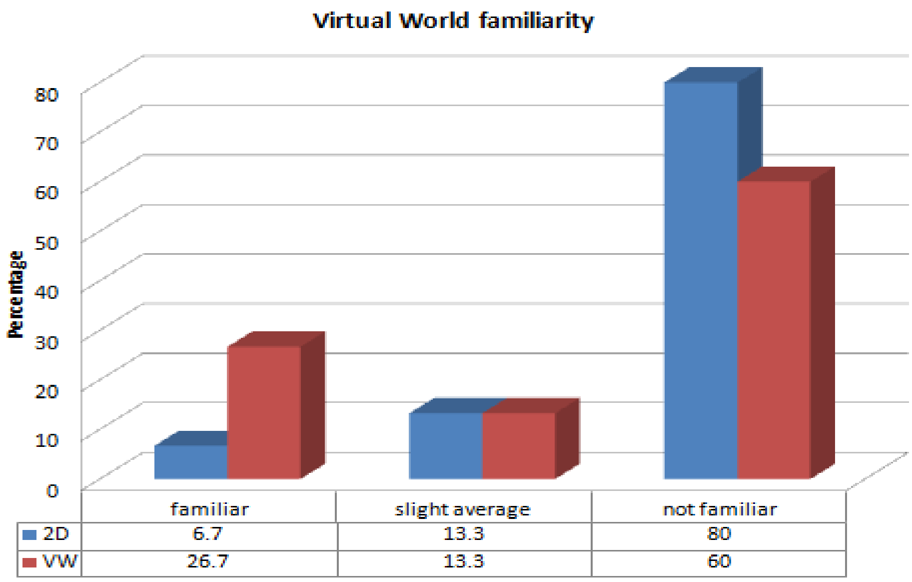
3D CDROM familiarity
Percentage
0 10 20 30 40 50 60
familiar | slight average | not familiar
2D 33.3 26.7 40
VW 20 53.3 26.7

(h)



Online 3D familiarity
Percentage
0 5 10 15 20 25 30 35 40 45 50
familiar | slight average | not familiar
2D 26.7 33.3 40
VW 33.3 46.7 20

(i)



(j)

Figure 5.19: Prior experience of users in both control (2DC) and experimental (VWC2) groups.

It can be noted in Figure 5.19 (a and b), the majority of users in both groups were using computers and Internet frequently (more than six hours weekly). Also, it can be seen in figure 5.19 (c) that, both groups (100%) were all familiar with web learning. Furthermore, 93.3% of both groups were familiar with flash (figure 5.19 d) and PowerPoint (figure 5.19 e) learning. Moreover, 100% of experimental group and 93.3% of the control group were familiar with video learning (figure 5.19 f). With respect to the stand alone and CDROM learning, the percentage of users' familiarity decreased. Figure 5.19 (g) shows the familiarity (from familiar and slight familiar categories) of both groups towards stand-alone technology where (both groups were 87.7%) were familiar. In addition, only 73.3% of experimental group and 60% of the control group were familiar with CDROM learning (figure 5.19 h).

Finally, figure 5.19 (I and j) revealed that the experimental (VWC2) group was more familiar with online 3D games and Virtual World learning applications in comparison with the control (2DC) group. What is more important is that most of them in both groups had no prior knowledge about online 3D Virtual World program (60% for VWC2 group and 80% for 2DC group). Users' profiles shown in Figure 5.18 and Figure 5.19 demonstrate that both groups, to a large extent, were equivalent in terms of users' individual characteristics and prior experience. Therefore, any differences between the two experimental conditions in the obtained results could be attributed to the treatment carried out on the participants.

5.7 Results and Analysis

The results of both groups (2DC and VWC2) were analysed in terms of usability (perceptive answer in terms of ease of use, efficacy, aesthetic and presence), effectiveness (percentage of correctly answered questions), and user satisfaction (based on a rating scale). Since the data normally distributed, the independent t-test was used to evaluate the significance of the difference between the two-groups in regard to each of these parameters. This statistical test is applicable when two different experimental conditions are tested independently by two groups (2DC and VWC2) by users. In this experiment, the t-test can compares the actual difference between two means in relation to the variation in the data (expressed as the standard deviation of the difference between the means). Otherwise, Mann-Whitney test was used as a non-parametric equivalent of the independent t-test. It is used to test whether two population means of both groups are equal or not. The Chi - square test was used for statistical analysis of categorical data. It is used to test differences between means. All these statistical analyses were conducted at α=0. 05 and significant difference was detected if ρ-value was found to be less than 0.05.

5.7.1 Usability and Users' Perception

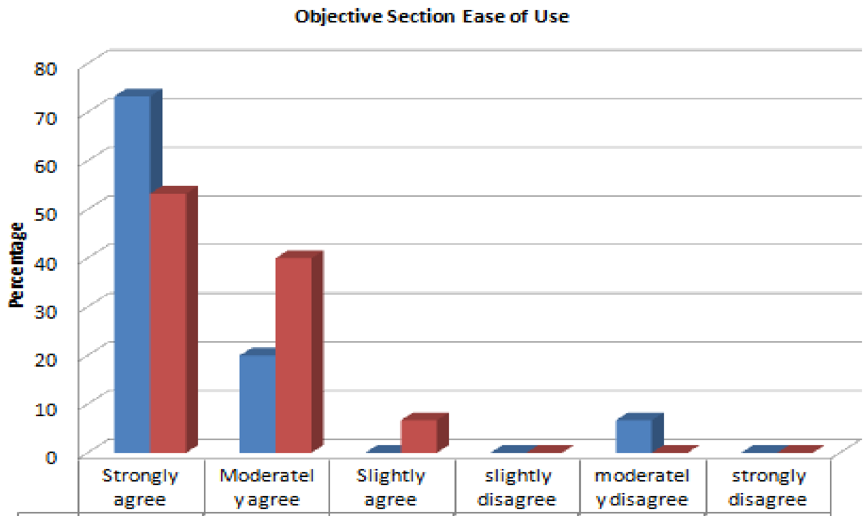
Each user had to answer 4 questions in total. Each of questions resembles ease of use, efficacy, aesthetic and presence. The first question tested the ease of use, second question tested the efficacy, third question tested the aesthetic and the last question tested presence criteria of each section of the OTQT framework on each platform. The six-point Likert scale which start from as 1 for the value of most disagreement until 6 of the value of most agreements were used for positive statement and vice-versa for negative statement.

5.7.1.1 Usability Perception of Objective Section

Table 5. 6 shows the statistical result of the first hypothesis and the figure 5.20 (a-d) shows the positive perception graph towards objective section in term of ease of use, efficacy, aesthetic and presence for both groups.

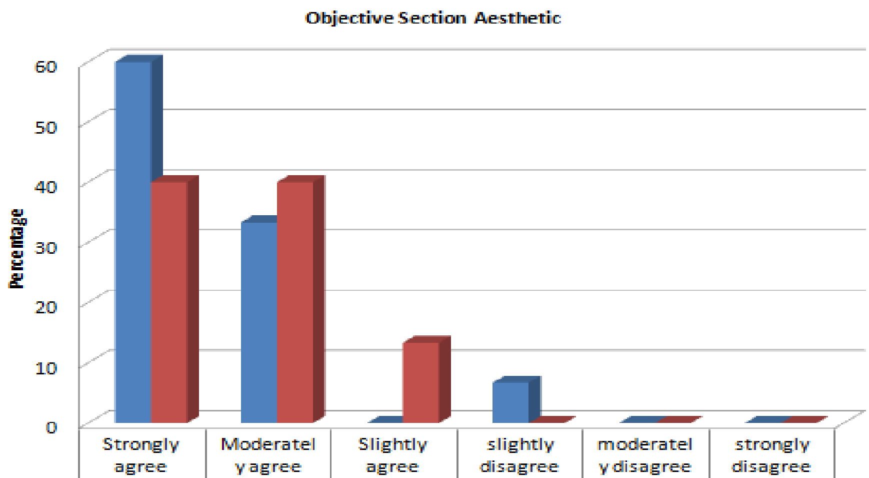
Table 5.6: The statistical result of the 1st hypothesis.

Hypothesis 1	**Result**
The VWC will express positive views about the same as standard 2DC in term of perception (ease of use, efficacy and aesthetic) in Objective Sections of the courseware.	The overall mean usefulness perception score of the control group (2D) was 5.47 (91.17%) and 5.31 (88.5%) for the experimental group (VWC2)



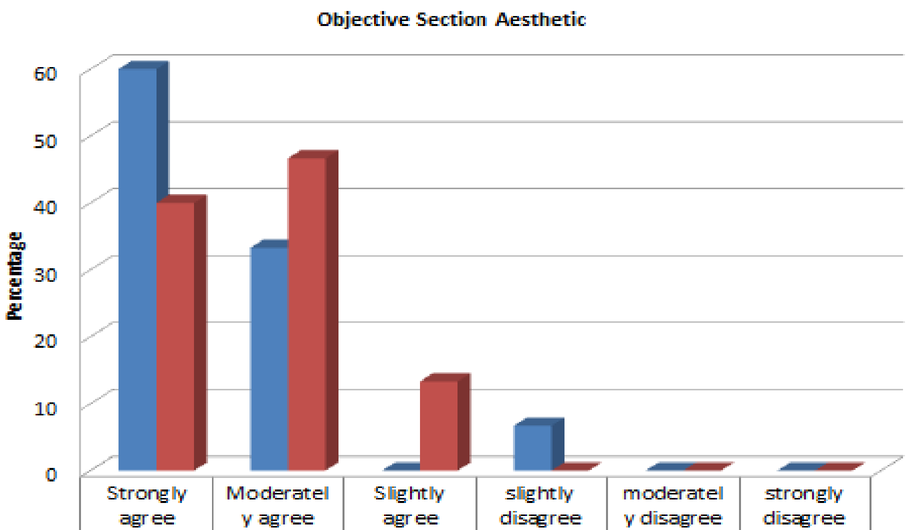
	Strongly agree	Moderately agree	Slightly agree	slightly disagree	moderately disagree	strongly disagree
2D	73.3	20	0	0	6.7	0
CW	53.3	40	6.7	0	0	0

(a)



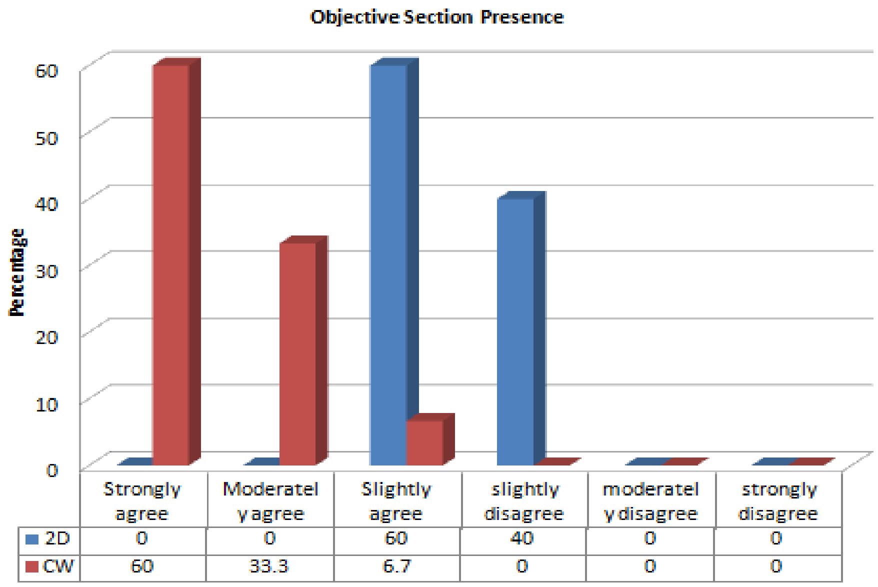
	Strongly agree	Moderately agree	Slightly agree	slightly disagree	moderately disagree	strongly disagree
2D	60	33.3	0	6.7	0	0
CW	40	40	13.3	0	0	0

(b)



	Strongly agree	Moderately agree	Slightly agree	slightly disagree	moderately disagree	strongly disagree
2D	60	33.3	0	6.7	0	0
CW	40	46.7	13.3	0	0	0

(c)



(d)

Figure 5.20 shows the usability perceptions of an objective section in each group.

The tables (5.7 and 5.8) below shows the mean and standard deviation of both platforms and table 5.9 shows mean perception different of Objective Section of t-test result between both platform.

Table 5.7: 2DC Mean and standard deviation

Variable	**Mean**	**Std Dev**	**Minimum**	**Maximum**
Q1	5.53 (92.17%)	1.06	2	6
Q2	5.47 (91.17%)	0.834	3	6
Q3	5.4 (90%)	1.242	2	6
Q4	3.6 (60%)	0.507	3	4

Table 5.8: VWC2 Mean and standard deviation

Variable	**Mean**	**Std Dev**	**Minimum**	**Maximum**
Q1	5.47 (91.17%)	0.64	4	6
Q2	5.27 (87.83%)	0.704	4	6
Q3	5.2 (86.67%)	1.134	4	6
Q4	5.53 (92.17%)	0.64	4	6

Table 5.9 shows t test results of mean perception difference of the Objective Section between both platforms.

	Critical Value (two tail)	t
Q1	2.048	0.1876
Q2	2.048	0.7097
Q3	2.048	0.4606
Q4	2.048	-9.1549

As shown in table 5.7 and figure 5.23, the overall mean usefulness perception score for the users in the control group (2D) was 5.0 (83.33%) compare to an experimental group (VWC2) was 5.37 (89.5%). However, when we remove the presence score which clearly contradict between both groups, the mean usefulness perception score of the control group (2D) was 5.47 (91.17%) and 5.31 (88.5%) for the experimental group (VWC2) in term of three criteria of ease of use, efficacy, and aesthetic. The t-test calculations showed that the overall difference in positive perception between both groups for three criterias, was statistically significant (t (28) = 1.72, CV=2. 048, ρ <0.05) and still statistically significant for four criteria (t (28) = -0.775, CV=2. 048, ρ <0.05).

Refer to Appendix B5 for users' responses to the perception questionnaire, it can be seen that agreement of the Objective Section of VWC2 was positive and close to the 2DC. The ease of use (Q1) of both platforms of the Objective Section for the OTQT framework were high in which the positive perception of the VWC2 platform (92.17%) was nearly as close as standard 2DC (91.17%) and the difference between these two groups was statistically significant (t (28) =0. 1876, CV=2. 048, ρ <0.05). In addition, the efficacy (Q2) of both platforms were also high in which the positive perception of the VWC2 platform (87.83%) was a slightly lower than the 2DC platform (91.17%). The positive efficacy difference between these two groups was higher and statistically significant (t (28) =0.7097, CV=2.048, ρ <0.05). Furthermore, the aesthetic (Q3) of both platforms were still high in which the positive perception of the VWC2 platform (86.67%) was a little lower than the 2DC (90%) platform. The positive aesthetic perception difference between these two groups was highest among three criteria but still statistically significant (t (28) =0. 4606, CV=2. 048, ρ<0.05). Meanwhile, the presence (Q4) of Objective Section in OTQT framework for VWC2 (92.17%) perceived higher positive perception than 2DC (60%). However, the difference of these two platforms was not statistically significant (t (28) = -9.1549, CV=2.048, ρ <0.05). That's mean the presence score for both platform is not reliable as comparison.

On an overall, all users in the experimental group (VWC2) thought that the tested Objective Section interface was usable as used in the control group (2DC) interface. In brief, using Objective Section of the OTQT framework resulted in generating more than two third positive views of users and less than 3% as standard 2DC (flash interface). Therefore, the Objective Section of OTQT framework of OTQT can be considered in developing Virtual World courseware. The suggestion was mainly on text readability (Table 5.10) as suggested by Leykin (2004) for reality systems.

Table 5.10 shows objective section comments of both control and experimental courseware.

Objective Comment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	clear	3	10.0	27.3	27.3
	simple	1	3.3	9.1	36.4
	interactive	1	3.3	9.1	45.5
	slow movement	1	3.3	9.1	54.5
	too much explanation	1	3.3	9.1	63.6
	make a list	1	3.3	9.1	72.7
	instruction should be clearer	1	3.3	9.1	81.8

	more models n background music	1	3.3	9.1	90.9
	make it more simple	1	3.3	9.1	100.0
	Total	11	36.7	100.0	
Missing	System	19	63.3		
Total		30	100.0		

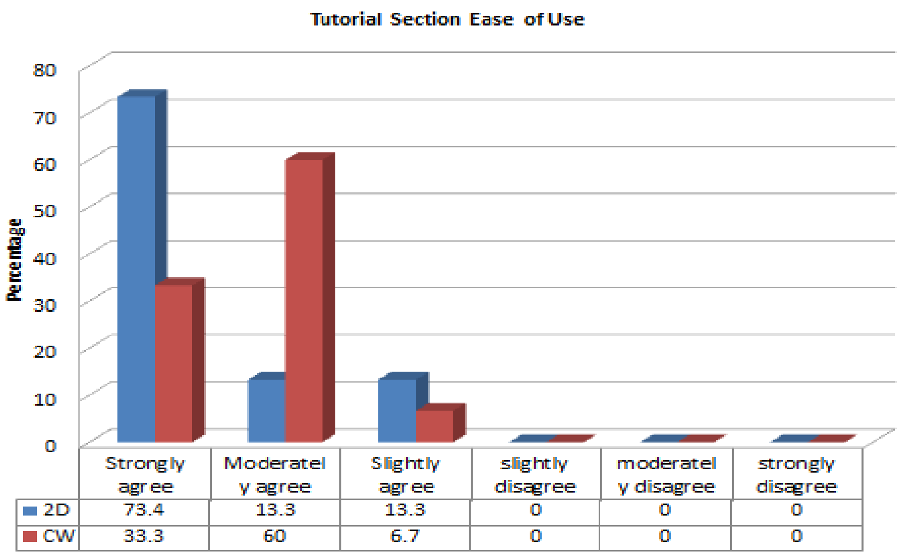
5.7.1.2 Usability Perception of Tutorial Section

Table 5.11 shows the statistical result of the first hypothesis and the figure 5.24 (a-d) shows the positive perception graph towards tutorial section in term of ease of use, efficacy, aesthetic and presence for both groups.

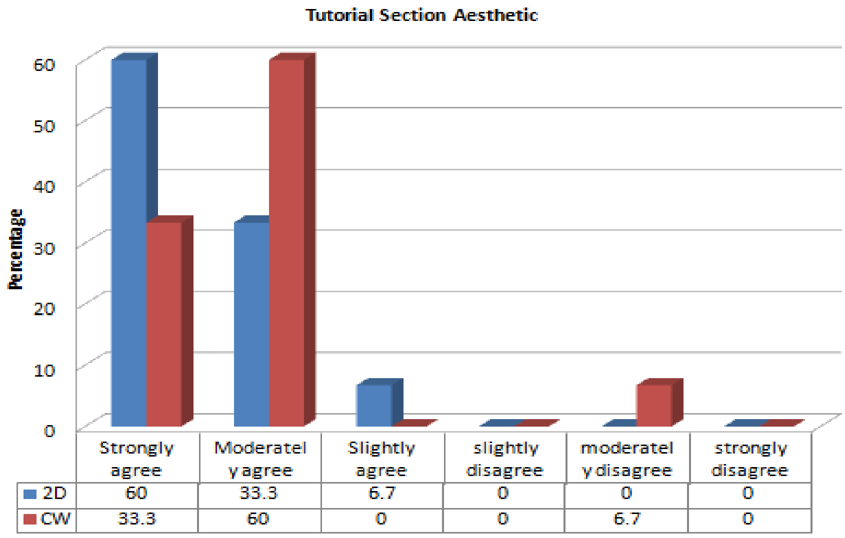
Table 5.11: The statistical result of the 2th hypothesis.

Hypothesis 2	Result
The VWC will express positive views about the same as standard 2DC in term of perception (ease of use, efficacy and aesthetic) in Tutorial Sections of the courseware.	The mean usefulness perception score of the control group (2DC) was 5.36 (89.33%) and 5.18 (86.33%) for the experimental group (VWC2) by removing presence score .

Each Question

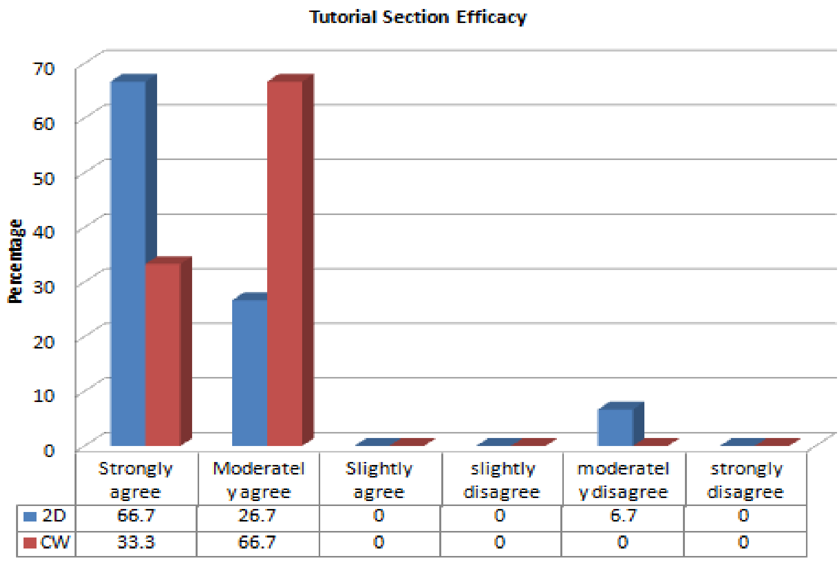


(a)



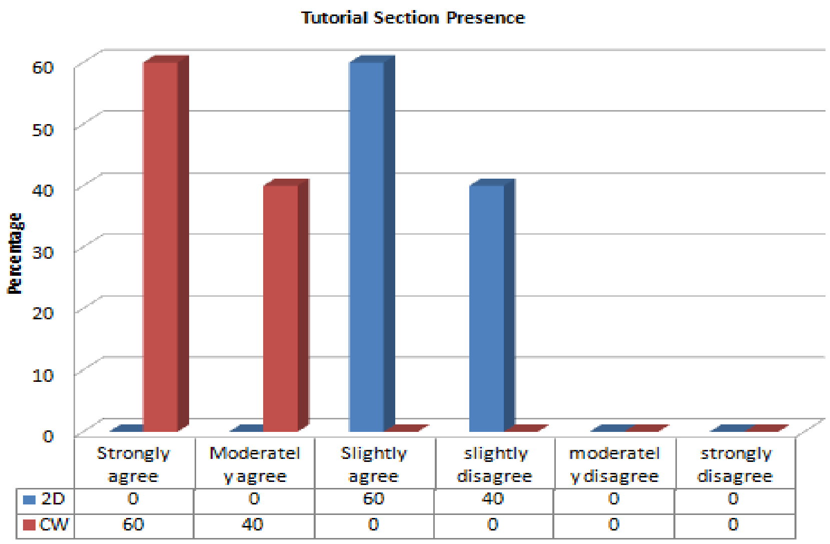
	Strongly agree	Moderately agree	Slightly agree	slightly disagree	moderately disagree	strongly disagree
2D	60	33.3	6.7	0	0	0
CW	33.3	60	0	0	6.7	0

(b)



	Strongly agree	Moderately agree	Slightly agree	slightly disagree	moderately disagree	strongly disagree
2D	66.7	26.7	0	0	6.7	0
CW	33.3	66.7	0	0	0	0

(c)



	Strongly agree	Moderately agree	Slightly agree	slightly disagree	moderately disagree	strongly disagree
2D	0	0	60	40	0	0
CW	60	40	0	0	0	0

(d)

Figure 5.21 shows the usability perceptions of Tutorial section in each group.

The tables (5.12 and 5.13) below shows the mean and standard deviation of both platforms and table 5.14shows mean perception different of tutorial Section of t-test result between both platform.

Table 5.12: 2DC Mean and standard deviation

Variable	**Mean**	**Std Dev**	**Minimum**	**Maximum**
Q1	5.6 (93.33%)	0.737	4	6
Q2	5.53 (92.17%)	0.64	4	6
Q3	5.47 (91.17%)	1.06	2	6
Q4	3.6 (60%)	0.507	3	4

Table 5.13: VWC2 Mean and standard deviation

Variable	**Mean**	**Std Dev**	**Minimum**	**Maximum**
Q1	5.27 (87.83%)	0.594	4	6
Q2	5.27 (87.83%)	0.990	2	6
Q3	5.33 (88.83%)	0.488	5	6
Q4	5.6 (93.33%)	0.507	5	6

Table 5.14shows t test results of mean perception difference of Tutorial Section between both platforms.

	Critical Value (two tail)	t
Q1	2.048	1.3502
Q2		0.8542
Q3		0.4647
Q4		-10.8032

The overall mean usefulness perception score for the users in the control group (2DC) was 4.95 (82.5%) compare to an experimental group (VWC2) was 5.12 (85.33%). The presence score which clearly contradict between both groups (the t is not statistically significant for Q4) has been rdisregard, thus the mean usefulness perception score of the control group (2DC) was 5.36 (89.33%) and 5.18 (86.33%) for the experimental group (VWC2) in term of three criteria of ease of use, efficacy, and aesthetic. The t-test calculations showed that the overall difference in positive perception between both groups for three criteria was statistically significant ($t(28) = -0.647$, $CV=2.048$, $\rho < 0.05$) and not statistically significant for four criteria ($t(28) = 5.72$, $CV=2.048$, $\rho < 0.05$).

Refer to Appendix B5 for users' responses to the perception questionnaire, it can be seen that agreement of Tutorial Section of VWC2 was given more than two third positive result and nearly close (5%) as 2DC. The ease of use (Q1) of both platforms of the Tutorial Section for the OTQT framework were high in which the positive perception of the VWC2 platform (87.83%) was nearly as close as standard 2DC (93.33%) and the difference between these two groups was statistically significant ($t(28) = 1.3502$, $CV=2.048$, $\rho < 0.05$). In addition, the efficacy (Q2) of both platforms were also high in which the positive perception of the VWC2 platform (87.83%) was a slightly lower than the 2DC platform (92.17%). The positive efficacy difference between these two groups was higher and statistically significant ($t(28) = 0.8542$, $CV=2.048$, $\rho < 0.05$). Furthermore, the aesthetic (Q3) of both platforms were still high in which the positive perception of the VWC2 platform (88.83%) was a little lower than the 2DC (91.17%) platform. The positive aesthetic perception difference between these two groups was highest among three criteria but still statistically significant ($t(28) = 0.4647$, $CV=2.048$, $\rho < 0.05$). Meanwhile, the presence (Q4) of Tutorial Section in OTQT framework for VWC2 (93.33%) perceived higher positive perception than 2DC (60%). However, the difference of these two platforms was not statistically significant ($t(28) = -10.8032$, $CV=2.048$, $\rho < 0.05$).

On an overall, all users in the experimental group (VWC2) thought that the tested Tutorial Section interface was usable as used in the control group (2DC) interface which use standard instructional design. In brief, using Tutorial Section of the OTQT framework resulted in generating positive views of users as close as standard 2DC (flash interface). Therefore, the Tutorial Section in the framework of OTQT can be considered in developing Virtual World courseware. The suggestion of the Tutorial Section mainly on instructional direction and improve the environment presence is shown in the Table 5.15.

Table 5.15 shows tutorial section comments of both control and experimental courseware.

Tutorial Comment

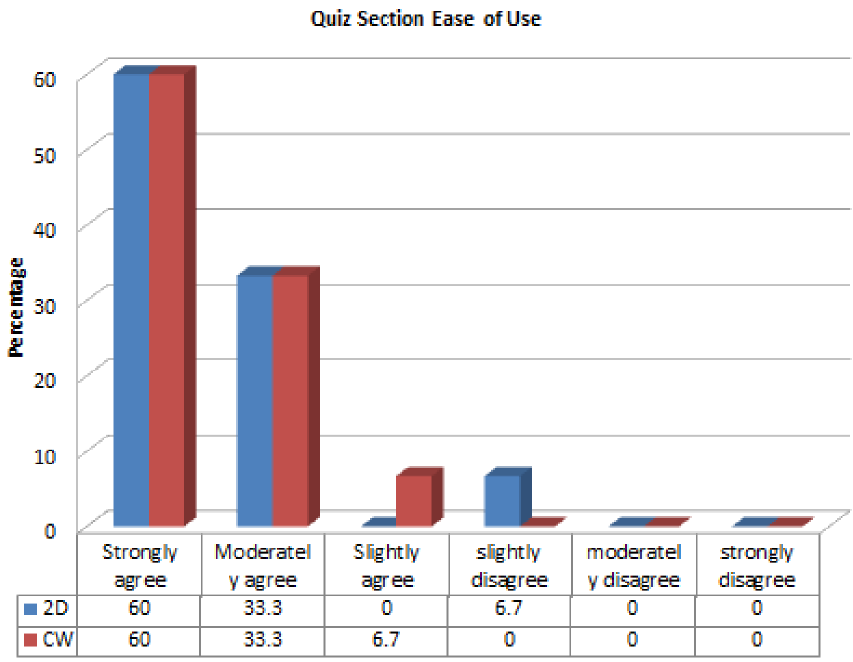
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	add more info	2	6.7	16.7	16.7
	clear	1	3.3	8.3	25.0
	pictures not relevant	1	3.3	8.3	33.3
	add simulation	1	3.3	8.3	41.7
	feel like playing games	1	3.3	8.3	50.0
	wall design inappropriate	1	3.3	8.3	58.3
	video should be shorter	1	3.3	8.3	66.7
	make a clearer environment	2	6.7	16.7	83.3
	make clear direction	1	3.3	8.3	91.7
	add sounds	1	3.3	8.3	100.0
	Total	12	40.0	100.0	
Missing	System	18	60.0		
Total		30	100.0		

5.7.1.3 Usability Perception of Quiz Section

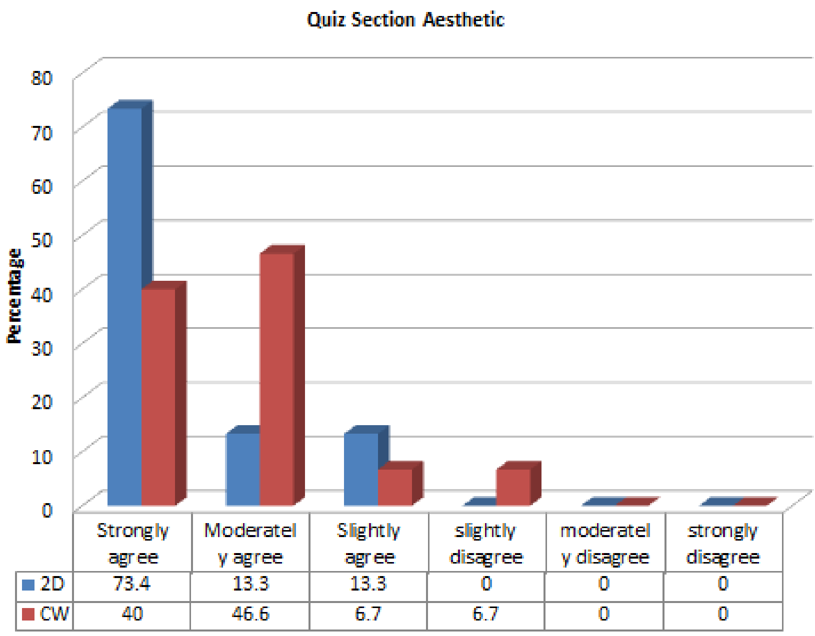
Table 5.16 below shows the statistical result of the third hypothesis and the figure 5.22 (a-d) shows the positive perception graph in term of ease of use, efficacy, aesthetic and presence for both groups.

Table 5.16: The statistical result of the 3th hypothesis.

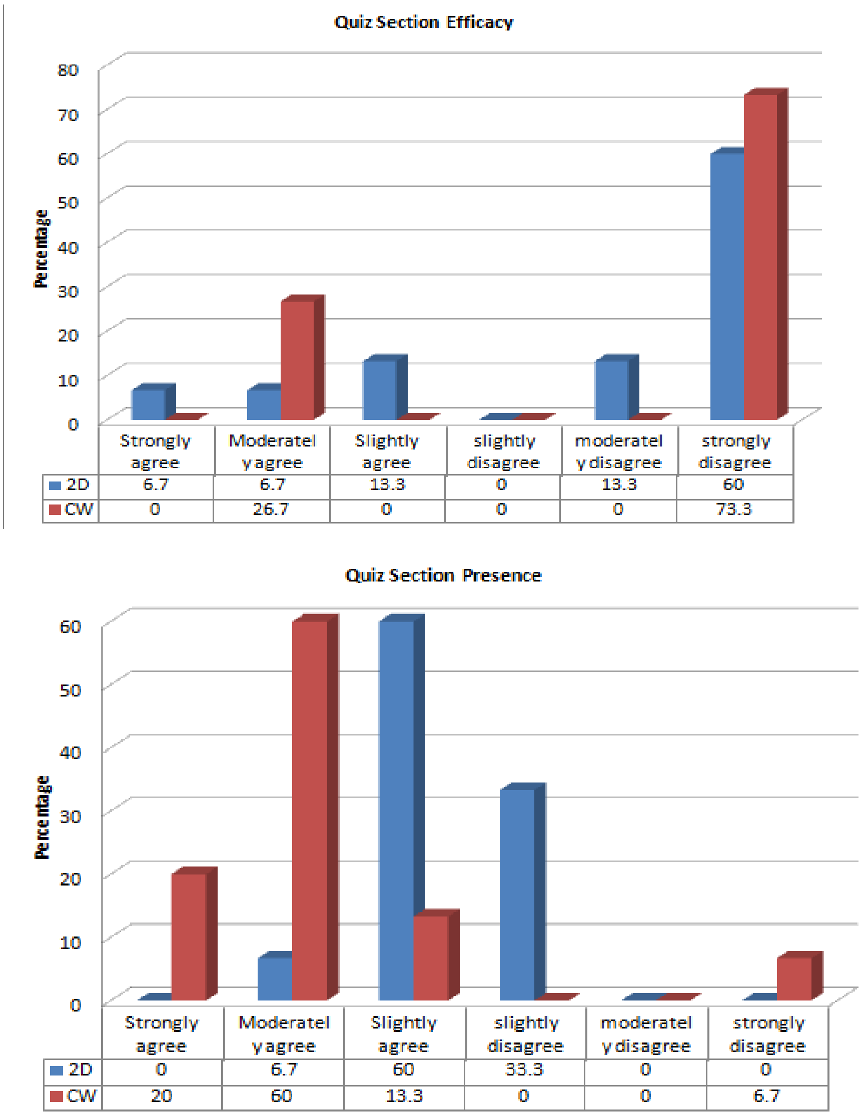
Hypothesis 3	**Result**
The VWC will express positive views about the same as standard 2DC in term of perception (ease of use, efficacy and aesthetic) in Quiz Section of the courseware.	The mean usefulness perception score of the control group (2DC) was 5.53 (92.17%) and 5.29 (88.17%) for the experimental group (VWC2)



(a)



(b)



(c)

(d)

Figure 5.22: shows the usability perceptions of the Quiz section in each group.

The tables (5.17, 5.18 and 5.19) below shows the mean and standard deviation of both platforms and table 5.19 shows mean perception different of Quiz Section in t-test result between both platform. The overall mean usefulness perception score for the users in the control group (2DC) was 5.05 (84.17%) compare to an experimental group (VWC2) was 5.37 (89.5%). The presence score which clearly contradict between both groups (the t is not statistically significant for Q4-table 5.22) has been removed and the mean usefulness perception score of the control group (2DC) become 5.53 (92.17%) and 5.29 (88.17%) for the experimental group (VWC2) in term of three criteria of ease of use, efficacy, and aesthetic. The t-test calculations showed that the overall difference in positive perception between both groups for three criteria was statistically significant (t (28) = -0.387, CV=2.048, ρ <0.05) and still statistically significant for four criteria (t (28) = 0.923, CV=2.048, ρ <0.05).

Table 5.17: 2DC Mean and standard deviation of usability

Variable	**Mean**	**Std Dev**	**Minimum**	**Maximum**
Q1	5.47 (91.17%)	0.834	3	6
Q2	5.6 (93.33%)	0.737	4	6
Q3	5.0 (83.33%)	1.604	1	6
Q4	3.73 (62.17%)	0.594	3	5

Table 5.18: VWC2 Mean and standard deviation

Variable	**Mean**	**Std Dev**	**Minimum**	**Maximum**
Q1	5.27 (87.83%)	0.497	5	6
Q2	5.2 (91.67%)	0.862	4	6
Q3	5.07 (84.5%)	0.458	5	6
Q4	4.93 (82.17%)	1.207	1	6

Refer to Appendix B5 for users' responses to the perception questionnaire, it can be seen that agreement of Quiz Section of VWC2 was positive and close to the 2DC. The ease of use (Q1) of both platforms of the Quiz Section for the OTQT framework were high in which the positive perception of the VWC2 platform (87.83%) was nearly as close as standard 2DC (91.17%) and the difference between these two groups was statistically significant (t (28) =0. 7979, CV=2. 048, ρ <0.05). In addition, the efficacy (Q2) of both platforms were also high in which the positive perception of the VWC2 platform (91.67%) was a slightly lower than the 2DC platform

(93.33%). Table 5.19 shows t test results (mean perception difference) of Quiz Section between both platforms.

Table 5.19 shows t test results (mean perception difference) of Quiz Section between both platforms.

	Critical Value (two tail)	t
Q1	2.048	0.7979
Q2		1.3661
Q3		-0.1625
Q4		-3.4548

The positive efficacy difference between these two groups was higher but still statistically significant (t (28) =1.3661, CV=2.048, ρ <0.05). Furthermore, the aesthetic (Q3) of both platforms were still high in which the positive perception of the VWC2 platform (83.33%) was a little lower than the 2DC (84.5%) platform. The positive aesthetic perception difference between these two groups was lowest among three criteria and statistically significant (t (28) =-0.1625, CV=2. 048, ρ <0.05). Meanwhile, the presence (Q4) of Quiz Section in OTQT framework for VWC2 (82.17%) perceived higher positive perception than 2DC (62.17%). However, the difference of these two platforms was not statistically significant (t (28) = -3.4548, CV=2.048, ρ <0.05).

On an overall, all users in the experimental group (VWC2) thought that the tested Quiz Section interface was usable as used in the control group (2DC) interface. In brief, using Quiz Section of OTQT framework resulted in generating positive views of users as close as standard 2DC (flash interface). Therefore, the Quiz Section of OTQT framework can be considered in developing Virtual World courseware. The improvement can be done on adding more 3D simulated graphic environment in Quiz Section and sound (Table 5.20).

Table 5.20 shows Quiz Section comments of both control and experimental courseware.

Quiz Comment

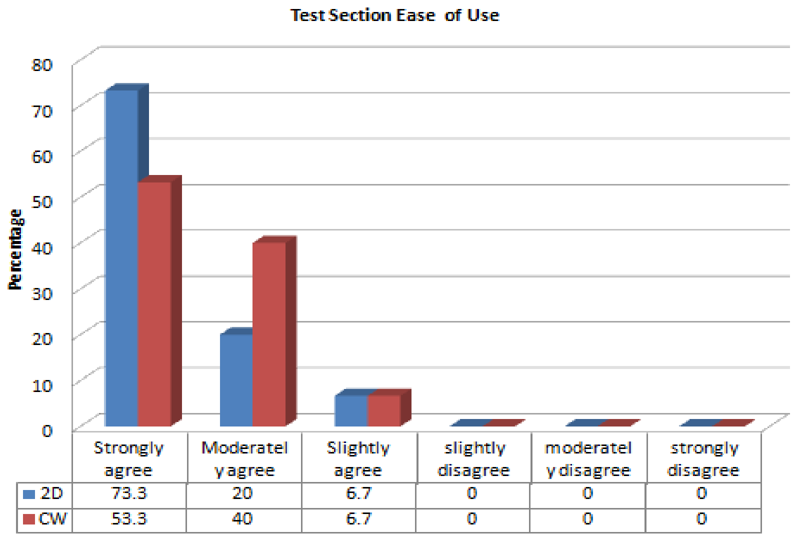
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	relevant	2	6.7	22.2	22.2
	scattered answer	1	3.3	11.1	33.3
	improve graphic and add sound	1	3.3	11.1	44.4
	advance exam	1	3.3	11.1	55.6
	easy	1	3.3	11.1	66.7
	understandable	1	3.3	11.1	77.8
	too easy, make more difficult	1	3.3	11.1	88.9
	good	1	3.3	11.1	100.0
	Total	9	30.0	100.0	
Missing	System	21	70.0		
Total		30	100.0		

5.7.1.4 Usability Perception of Test Section

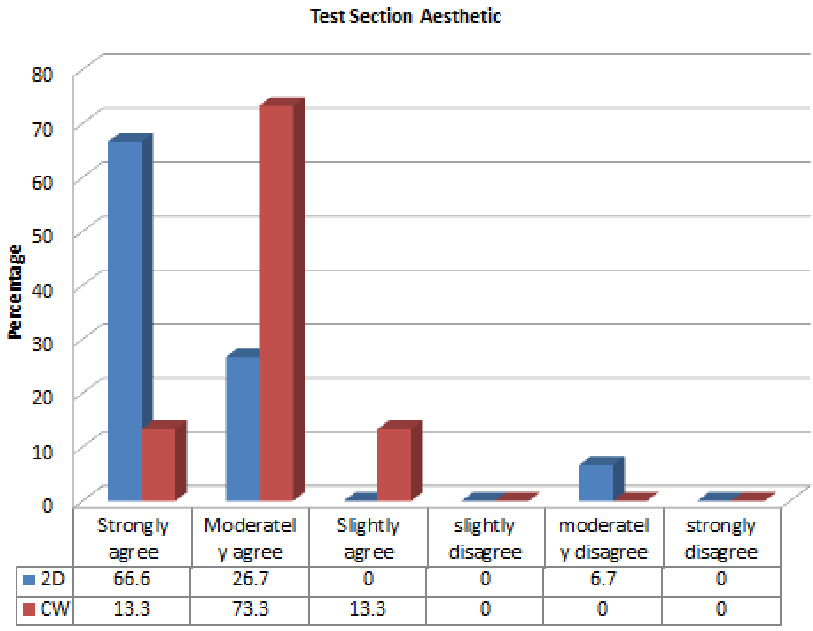
Table 5.21 below shows the statistical result of usability perception which connect to fourth hypothesis and figure 5.23 (a-d) shows the usability perceptions of Test Section in both control (2DC0 and experimental (VWC2) groups.

Table 5.21: The statistical result of the 4th hypothesis.

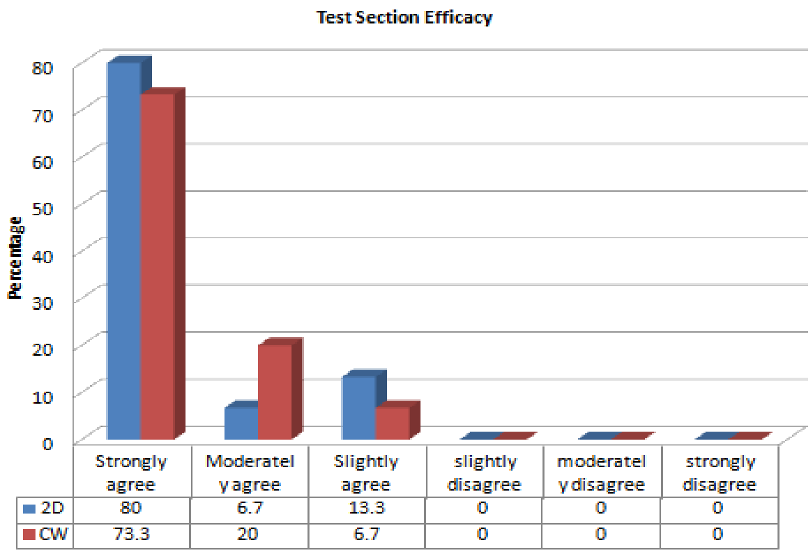
Hypothesis 4	**Result**
The VWC will express positive views about the same as standard 2DC in term of perception (ease of use, efficacy and aesthetic) in the Test Section of the courseware.	The mean usefulness perception score of the control group (2DC) was 5.38 (89.67%) and 5.60 (93.33%)


Test Section Ease of Use
Percentage
80
70
60
50
40
30
20
10
0
Strongly agree
Moderatel y agree
Slightly agree
slightly disagree
moderatel y disagree
strongly disagree
2D 73.3 20 6.7 0 0 0
CW 53.3 40 6.7 0 0 0

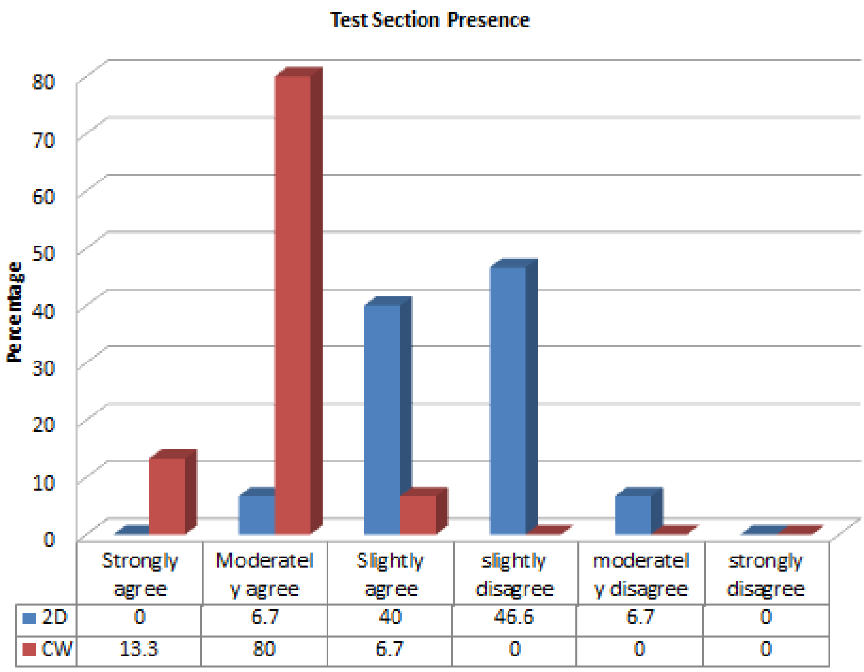
(a)


Test Section Aesthetic
Percentage
80
70
60
50
40
30
20
10
0
Strongly agree
Moderatel y agree
Slightly agree
slightly disagree
moderatel y disagree
strongly disagree
2D 66.6 26.7 0 0 6.7 0
CW 13.3 73.3 13.3 0 0 0

(b)


Test Section Efficacy
Percentage
80
70
60
50
40
30
20
10
0
Strongly agree
Moderatel y agree
Slightly agree
slightly disagree
moderatel y disagree
strongly disagree
2D 80 6.7 13.3 0 0 0
CW 73.3 20 6.7 0 0 0

(c)



(d)

Figure 5.23 shows the usability perceptions of Test Section in each group.

Table 5.22 and 5.22 show mean and standard deviation for 2DC and VWC2. As shown in table 5.22, the overall mean usefulness perception score for the users in the control group (2DC) was 5.07 (84.5%) compare to an experimental group (VWC2) was 5.30 (88.33%). However, when we remove the presence score which clearly contradict between both groups (the t is not statistically significant for Q4), the mean usefulness perception score of the control group (2DC) was 5.38 (89.67%) and 5.60 (93.33%) for the experimental group (VWC2) in term of three criteria of ease of use, efficacy, and aesthetic. Therefore the overall percentage of VWC2 was higher than 2DC in term of all criteria. The t-test calculations showed that the overall difference in positive perception between both groups for three criteria was statistically significant ($t\ (28) = -0.416$, $CV=2.048$, $\rho < 0.05$) and still statistically significant for four criteria ($t\ (28) = 1.07$, $CV=2.048$, $\rho < 0.05$).

Table 5.22: 2DC Mean and standard deviation

Variable	Mean	Std Dev	Minimum	Maximum
Q1	5.67 (94.5%)	0.617	4	6
Q2	5.47 (91.17%)	1.06	2	6
Q3	5.67 (94.5%)	0.724	4	6
Q4	3.47 (57.83%)	0.743	2	5

Table 5.23: VWC2 Mean and standard deviation

Variable	Mean	Std Dev	Minimum	Maximum
Q1	5.47 (91.17%)	0.64	4	6
Q2	5.0 (83.33%)	0.535	4	6
Q3	5.67 (94.5%)	0.617	4	6
Q4	5.07 (84.5%)	0.458	4	6

Table 5.24 shows t test results of mean perception difference of Test Section between both platforms. Refer to Appendix B4 for users' responses to the perception questionnaire, it can be seen that agreement of the Test Section of VWC2 was positive and close to the 2DC. The ease of use (Q1) of both platforms of the Test Section for the OTQT framework were high in which the positive perception of the VWC2 platform (91.17%) was nearly as close as standard 2DC (94.5%) and the difference between these two groups was statistically significant ($t (28) =0. 8713$, $CV=2. 048$, $\rho <0.05$). In addition, the efficacy (Q2) of both platforms were also high in which the positive perception of the VWC2 platform (83.33%) was a slightly lower than the 2DC platform (91.17%).

Table 5.24 shows t test results of mean perception difference of Test Section between both platforms.

	Critical Value (two tail)	t
Q1	2.048	0.8713
Q2		1.5331
Q3		0.0000
Q4		-7.1016

The positive efficacy difference between these two groups was highest among three criteria but still statistically significant ($t (28) =1. 5331$, $CV=2. 048$, $\rho <0.05$).

Furthermore, the aesthetic (Q3) of both platforms were still high in which the positive perception of the VWC2 platform (94.5%) was similar to the 2DC (94.5%) platform. The positive aesthetic perception difference between these two groups was null and statistically significant (t (28) =0. 0000, CV=2. 048, ρ <0.05). Meanwhile, the presence (Q4) of Test Section in OTQT framework for VWC2 (84.5%) perceived higher positive perception than 2DC (57.83%). However, the difference of these two platforms was not statistically significant (t (28) = -7.1016, CV=2.048, ρ <0.05).

On an overall, all users in the experimental group (VWC2) thought that the tested Test Section interface was usable as used in the control group (2DC) interface. In brief, using Test section of OTQT framework resulted in generating positive views of users as close as standard 2DC (flash interface) which already been published and marketed. Therefore, the Test Section of OTQT framework can be considered in developing Virtual World courseware. Table 5.25 shows users' comment to enhance the test section in further development.

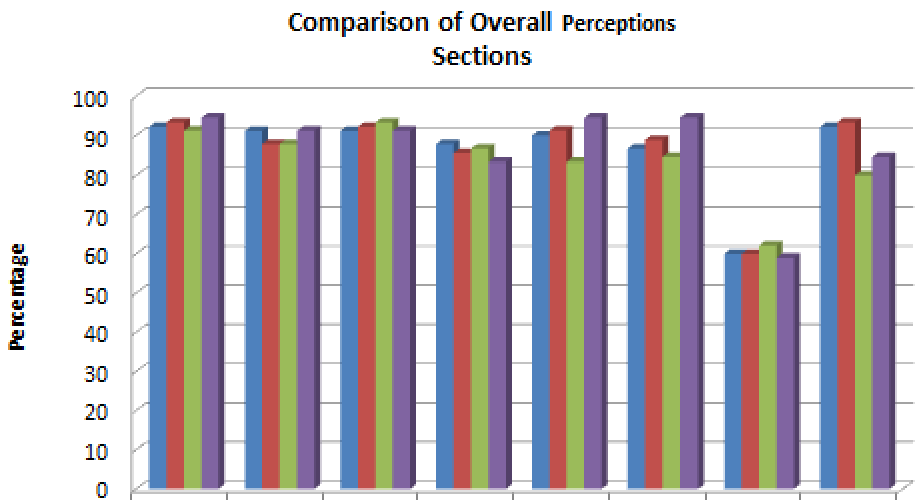
Table 5.25 shows Test Section comments of both control and experimental courseware.

Test Comment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	need to be design like real world	1	3.3	12.5	12.5
	improve the interface	1	3.3	12.5	25.0
	improve the language	1	3.3	12.5	37.5
	interesting	1	3.3	12.5	50.0
	background inappriopriate	1	3.3	12.5	62.5
	improve the text and make alignment	1	3.3	12.5	75.0
	improve animation	1	3.3	12.5	87.5
	box should be clear	1	3.3	12.5	100.0
	Total	8	26.7	100.0	
Missing	System	22	73.3		
Total		30	100.0		

5.7.1.5 Overall Usability and Users' Perception

The overall perception for the four section framework (OTQT) can be seen from their ease of use, aesthetic, efficacy and presence. Since presence criteria only suitable for Virtual World courseware, thus, for the comparison difference, only three criteria were involved. Figure 5.24: shows the percentage of the users' perception of four section framework in both groups in term of ease of use, aesthetic, efficacy and presence.



	Ease of use 2D	Ease of use VW	Aesthetic 2D	Aesthetic VW	Efficacy 2D	Efficacy VW	Presence 2D	Presence VW
Objective	92.16	91.16	91.16	87.83	90	86.67	60	92.17
Tutorial	93.33	87.83	92.17	85.5	91.17	88.83	60	93.33
Quiz	91.17	87.83	93.33	86.67	83.33	84.5	62.17	80
Test	94.5	91.17	91.17	83.33	94.5	94.5	59	84.5

Figure 5.24: shows the percentage of the users' perception of four section framework in both groups in term of ease of use, aesthetic, efficacy and presence.

It can be seen that the overall perceptions (ease of use, aesthetic, efficacy) of the four section framework (OTQT) for the experimental group (Virtual World courseware II) is very close or nearly match the control group (standard 2DC) except for presence criteria which obviously vice-versa. The overall perception score for VWC2 (5.27=87.86%) was slightly higher than 2DC (5.02=83.67%) if include presence. Meanwhile the overall mean presence score for the four sections in VWC2 platform was 5.25 (87.5%).

As shown in Figure 5.24, the mean perception score for the experimental group (VWC2) was less 3% compared to control group (standard 2DC). In comparison, overall perception means value (exclude presence) for the experimental group (VWC2) was 5.30 (88.33%) and 5.49 (91.5%) for the control group (2DC). Whereas, the mean perception for presence criteria which for experimental group alone was 5.25 (87.5%). The overall mean difference between the both groups in term of ease of use, aesthetic and efficacy was 0.197. In other words, the Virtual World courseware giving positive usability perception of 3.28 % less than control platform (standard 2DC). This is taken from the average percentage different from both platforms. The t-test calculations showed that the overall mean difference of the OTQT framework of both platforms in term of ease of use, aesthetic and efficacy (exclude presence-different platform) were statistically significant (t (11) =0. 41366 CV=2. 008, p<0.05). Table 5.26 above shows the statistical of the fifth hypothesis.

Table 5.26 shows the statistical result of the 5th hypothesis.

Hypothesis 5	**Result**
Users of VWC will express positive views towards the use of courseware in term of presence.	The overall mean presence score for the four sections in VWC2 platform was 5.25 (87.5%)

Experimental observations revealed that using four sections - frameworks (OTQT) in the Virtual World platform were usable in teaching alternative medicine health course. However, the presence criteria were only suitable for the validate Virtual World platform and not suitable used to compare with the two-dimensional courseware platform since they are totally different platform which have different sensors and environment. In summary, the users of the experimental group were statistically significantly affected in giving positive perception of four-section-framework (OTQT) embedded in Virtual World courseware. Therefore, it can be said that four section framework (OTQT) composed in virtual World courseware is usable in teaching alternative medicine in online 3D Virtual World platform.

5.7.2 Users' Performance

Table 5.27 shows the statistical result of the sixth hypothesis. The number of correctly answered questions was used as a measure of effectiveness. This measure was considered for all the questions in total, according to the question complexity (easy, moderate and difficult) as well as for each question and each user in both control and experimental groups. The control courseware is a flash courseware which developed according to the instructional standard which already been established and market all around the globe of multimedia and educational companies while experimental courseware is an experimental research courseware developed for this the study.

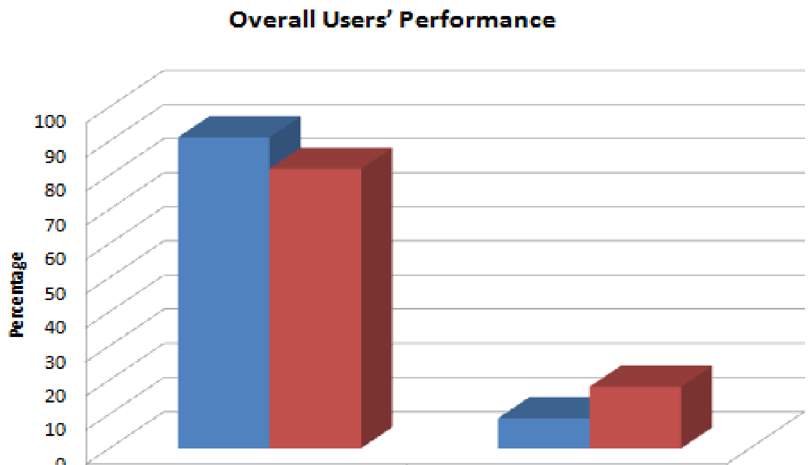
Table 5.27 shows the statistical result of the 6th hypothesis.

Hypothesis 6	**Result**
Users of the VWC2 will be perform about the same as standard 2DC users in term of correct answer percentage of the test result.	The VWC2 (81.9%) interface enhance student performance less 9% compared to 2DC (91.13%). The less percentage of performance in VWC2 was suggested by text readability in presenting information (Table 5.31).

Figures and tables below show the percentage of correct answers for all questions (figure 5.28) and question complexity (table 5.32) in 2DC and VWC2. It can be noticed that users of VWC2 almost reach the standard and established instructional 2DC in terms of correctness of answers to all questions as well as to each complexity level and question type. The raw data of correctness of users' answers can be found in Appendix B5.

5.7.2.1 All questions

The total number of questions in each group was 105 (15 user* 7 questions per user). Figure 5.25 shows the average percentage of correct answers achieved by users in both groups for all questions.



	Average correct answer	Average wrong answer
2D	91.13	8.87
VW	81.9	18.1

Figure 5.25: Average percentage of correct answers achieved by users in both groups for all questions.

In figure 5.25, it can be seen that the users of the VWC2 (81.9%) performed less well than the users of the 2DC (91.13%) with regard to the correctness rate of all answers. The difference percentage of correctly answered questions achieved in

VWC2 platform was 9.23% less than that attained in the 2DC platform. The total number of correct answers in the experimental group was 86 compared to 96 in the control group. The difference of correct answers between both groups was 10% which relatively high. The test results revealed that the difference in correctly answered questions between VWC2 and 2DC was statistically significant ($t(28) = 3.67$, $CV= 1.70$, $p< 0.05$). In summary, the development of courseware through online 3D Virtual World can be done and could enhance student performance as well as normal 2D courseware. However, further instructional and text enhancement can be done to increase its performance as reliable as 2DC such as commented in table 5.28.

Table 5.28 shows overall comments of both control and experimental courseware.

Overall Comments

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	this has highlight the forgotten knowledge	1	3.3	4.5	4.5
	technical:text distraction from other section	2	6.7	9.1	13.6
	interesting subject and knowledge	1	3.3	4.5	18.2
	interesting environment	4	13.3	18.2	36.4
	well structured	1	3.3	4.5	40.9
	good and nice	2	6.7	9.1	50.0
	challenging	1	3.3	4.5	54.5
	more real than 2d	1	3.3	4.5	59.1
	slow movement	1	3.3	4.5	63.6
	process understandable	1	3.3	4.5	68.2
	improve the q and a alignments	1	3.3	4.5	72.7
	improve structure and animation	1	3.3	4.5	77.3
	change subject	1	3.3	4.5	81.8
	add sound correct or wrong	1	3.3	4.5	86.4
	add more color	1	3.3	4.5	90.9
	2d is more interesting	1	3.3	4.5	95.5
	improve the 3d	1	3.3	4.5	100.0
	Total	22	73.3	100.0	
Missing	System	8	26.7		
Total		30	100.0		

According to Table 5.28, the major problem of text readability with questions and answers display (grey and not contrast with background colour) had distract in information delivery in the test section (Leykin 2004).

5.7.2.2 Question complexity

Tables 5.29 shows the correctness difference of users' answer to each question and and figure 5.26 shows chi square results for the correctness of users' to each complexity question (easy, moderate and difficult) for both platform.

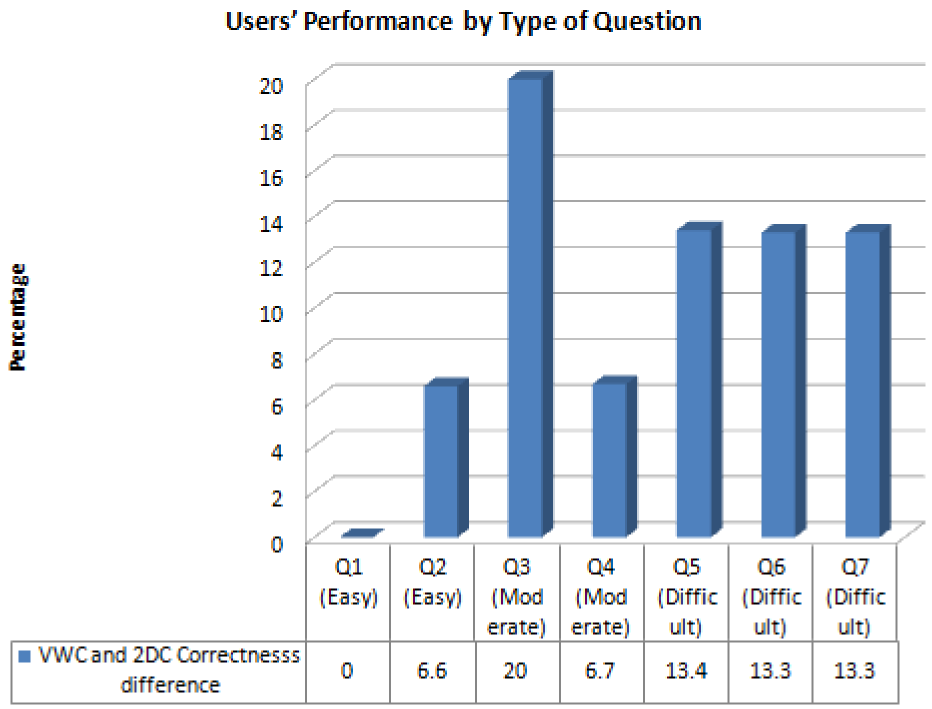


Figure 5.26: Correctness difference of users' answers to each question in both platforms

Table 5.29: Chi square results for the correctness of users' answers to each complexity question in both groups (df=1, CV= 3.84)

Question complexity	Q#	X^2 value	p-value	Significant
Easy	Q1	constant	null	no
	Q2	0.370	>0.05	no
Moderate	Q3	3.333	>0.05	no
	Q4	0.240	>0.05	no
Difficult	Q5	0.833	>0.05	no
	Q6	1.154	>0.05	no
	Q7	0.682	>0.05	no

Q1 and Q2 were easy questions, Q3 and Q4 were moderate questions and the rest (Q5, Q6 and Q7) were difficult questions. All seven questions were (Q&A) type of questions which has different numbers of answers. It can be noted that the VWC2 group differs differently to 2DC group in all levels of complexity . What is more, the difference in users' performance of the VWC2 group decreased than 2DC as the complexity increased.

In easy questions, the users of the VWC2 scored 3.3% less correct answers than those of the established instructional 2DC. However, the difference of VWC2 group was observed larger (13.35%) with respect to moderate and difficult questions to what has been achieved by the users of the 2DC group. The correct answer for VWC2 is 93.35% (easy), 80% (moderate), and 73.3% (difficult). On the other hand, the users of the 2DC in the control group, successfully responded to 96.65% of easy questions, 93.35% of moderate questions, and 86.67% of difficult questions. The results of Man-Whitney test showed that the difference in correct answers between VWC2 and 2DC is not statistically significant in easy questions (U=109, CV=64, p>. 05), moderate (U=97, CV=64, p>0.05) and difficult questions (U=97, CV=64, p>0.05). In brief, it can be said that both groups of users accomplished equivalent levels of accuracy of their answers to easy questions. However, the contribution of VWC2 in users' performance was obvious slightly less compare to 2DC in their response for higher complexity questions.

5.7.2.3 Each question

The percentage of users' correct answers to each question in each group is shown in figure 5.27 below.

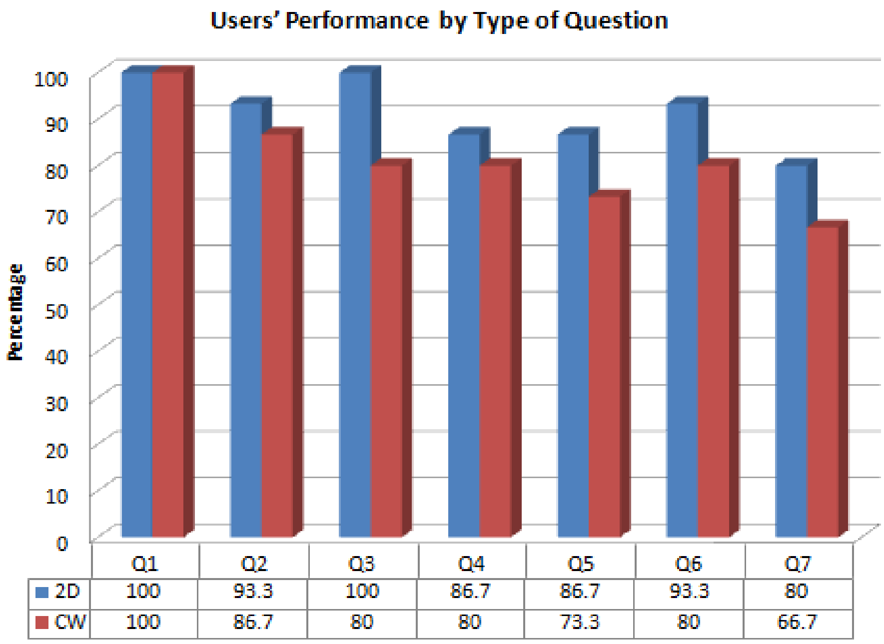


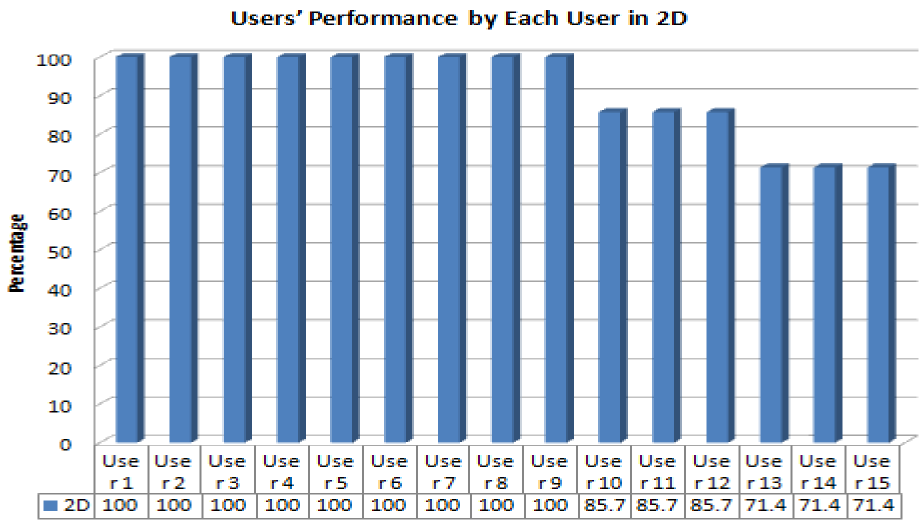
Figure 5.27: Percentage of correct answers achieved by the users of both groups for each question.

It can be seen that the users of the VWC2 performed 9% less (81.9%) than instructional 2DC users (91.13%) in their 6 out of 7 questions. Both group got 100% correct answer on Q1. Table 5.30 shows the Chi square results for correctness difference of users' answers to each lesson question in both groups.

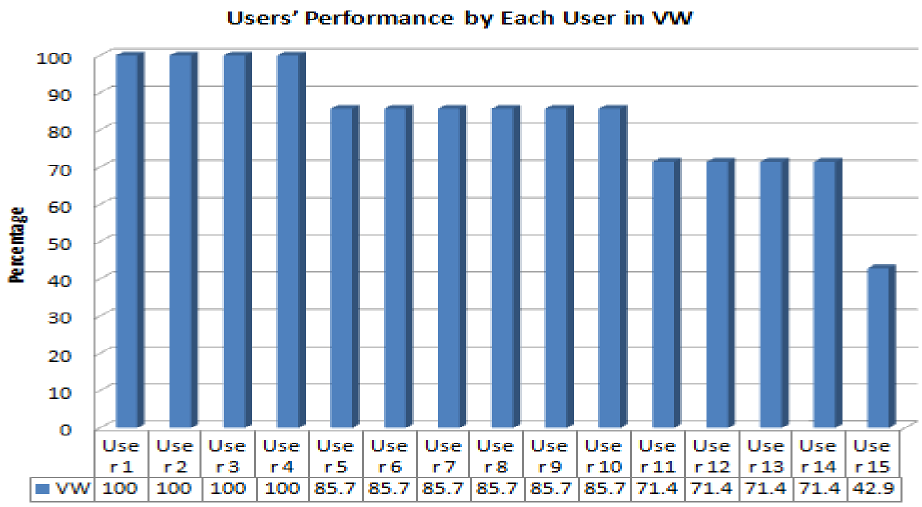
Chi-square results shown in Table 5.29 also demonstrated no statistically significant difference between the VWC and 2DC groups in term of percentage of correct answers. It can also be seen that there are no statistically significant differences were obtained in any of the questions (from Q1 to Q7). Therefore, it can be said that VWC2 is likely to perform as established instructional 2DC. On the whole, it can be said that the VWC2 used could contribute to users' performance in most of the required questions even though to a large extent, the design of the required questions did not permit clear impression about the role played by each of section in assisting VWC2 users.

5.7.2.4 Each User

It is worthy noting that 4 users (user 1 to 4 since it arranged ascending) of the VWC2 correctly answered all the 7 questions and another six users achieved 6 correct answers. The performance of VWC2 almost reaches a similar result of established instructional 2DC (flash) which 9 users gain all correct answers while others have one (three users) and two (three users) mistakes. Also, the weakest user in the experimental group (User 15) scored 2 correct answers less than that in the control group (User 15). Figure 5.31 shows the total number of correct answers achieved by each user in both control and experimental groups and figure 5.28 shows the total number of correct answers achieved by each user in both groups.



(a)



(b)

Figure 5.28: Total number of correct answers achieved by each user in both groups.

On average, the number of correct answers per user in the VWC2 was 5.73 compared to 6.4 in the established 2DC which differs only 0.67. In short, courseware in an online 3d Virtual World could contribute high performance as well as established 2D courseware with the further enhanced instructional elements.

5.7.3 Users' Satisfaction

User satisfaction in regard to different aspects of the applied online learning platform was measured in both groups by users' answers to the post-experimental questionnaire which consisted of 5 statements related interesting presentation, helpfulness, frustration, annoyance, and preferred learning. The two-point Likert scale which as 1 for the value of disagreement and 2 for the value of the agreement were used for positive statement and vice-versa for negative statement. The overall satisfaction score for each user was calculated using the SUS (System Usability Scale) method (Brooke, 1996). Table 5.30 shows the statistical result of the seventh hypothesis.

Table 5.30 shows the statistical result of the 7th hypothesis.

Hypothesis 7	**Result**
Users of the VWC2 will be about as satisfied as the 2DC users.	The VWC2 interface can be considered more satisfactory (98.7%) than the 2DC (84%).

The mean satisfaction score for the users in the experimental groups was 98.7% compared to 84% of the users in the control group. Statistically, the Man-Whitney test demonstrated that the difference in users' satisfaction between both groups was statistically significant ($U=44$, $CV=64$, $\rho < 0.05$). In other words, the VWC2 was more satisfactory than the 2DC. Figure 5.29 shows the frequency of the user agreement to each statement in the satisfaction questionnaire.

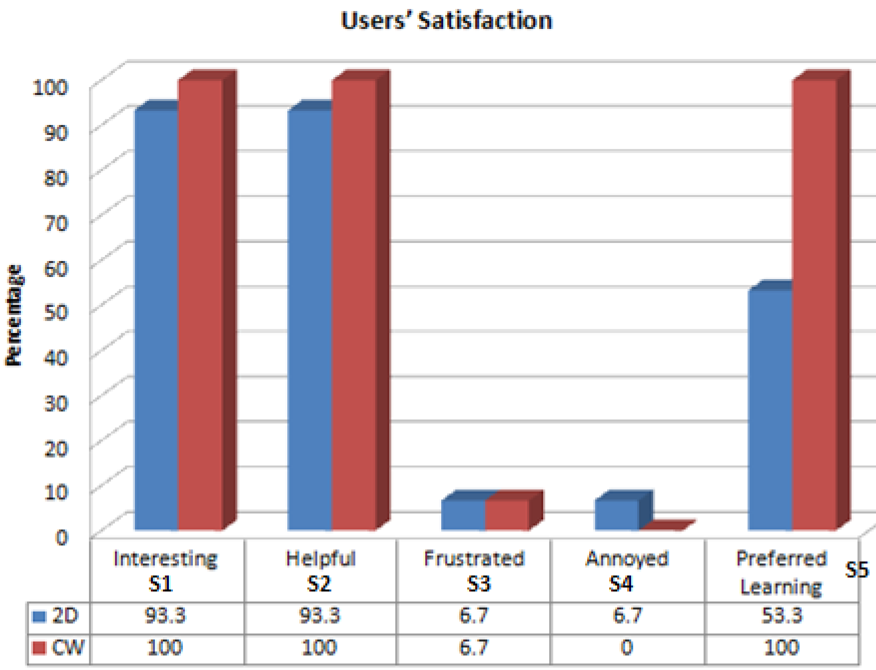


Figure 5.29 shows the frequency of the user agreement to each statement in the satisfaction questionnaire.

Refer to Appendix B5 for user 'responses to the satisfaction questionnaire. It can be seen that agreement of VWC2 were higher than 2DC and in both S1 and S2, whereas similar levels of agreement were expressed by users in both groups for ease of use (S3). However, the VWC2 was less annoyed (S4) as opposed to the 2DC. In the last statement of S5, 53.3 % of users preferred 2DC which is an only slightly above the average while 100% of users in VWC2 group agreed that the VWC2 platform was preferred in online learning. In details, the VWC (100%) is more interesting and helpful than the 2DC (93.3%). Meanwhile, users both VWC and 2DC groups express very slight frustration (6.7%) towards both platforms. Furthermore, using VWC2 (0%) is less annoyed compared to 2DC (6.7%). On an overall, all users in the experimental group (VWC2) were satisfied with the tested interface (S5) whereas the less percentage 54% was observed for users in the control group (2DC). In brief, using the VWC2 with OTQT framework resulted in generating positive views of users. Therefore, the VWC2 interface can be considered more satisfactory than the 2DC.

5.8 Discussion and Summary

The present empirical study investigated the usability and learning performance of the multisection 3D Virtual Worlds online learning interface as compared to standard and well-known two-dimensional flash graphic one. The obtained results have been used to compare the two interfaces in terms of user perception, performance and satisfaction. The present study also focused on the four-section framework of objective, tutorial, quiz and test (OTQT) in terms of ease of use, efficacy, aesthetic and presence. Therefore, these results are discussed from the following three angles to get an insight into what contribution has been made by the 3D Virtual World courseware II and OTQT framework in users' performance, perception and satisfaction. Table 5.31 below shows the overall statistical result of the usability and the role of OTQT framework in VWC2.

Table 5.31 shows the overall statistical result of the usability and the role of OTQT framework in VWC2.

OTQT Usability in VWC2	Statistical result
Positive perception of the required learning question in total and in terms of ease of use, efficacy, aesthetic and presence.	The overall perception score for VWC2 (5.27=87.86%) was slightly higher than 2DC (5.02=83.67%). See details result in 5.7.1.
Correctness of users' answers to the required questions in total and in terms of complexity and type	Users of the VWC2 (81.9%) performed slightly less (9.13%) than the users of the 2DC (91.13%) with regard to the correctness rate of all answers. This

(effectiveness and learning performance)	might due to text readability as an information display (Leykin 2004) in an overall command in table 5.23. See details result in section 5.7.2.
User satisfaction and experience with both of tested online learning courseware interfaces.	The mean satisfaction score for the users in the experimental groups (VWC2) was higher than the users in the control group (2DC) that was 98.7% compared to 84%. See details result in section 5.7.3.

Although the Virtual World courseware with OTQT framework was newly designed with similar learning lesson module of cupping treatment to standard two-dimensional flash courseware, the obtained results showed that 3D Virtual World courseware with OTQT framework is more usable (in term of satisfaction and positive views) and about matching the usability and performance of standard two-dimensional flash courseware which already established in the market. The instructional design of text readability (Leykin 2004) was suggested as a major cause on information display in VWC2 (Table 5.31).

This chapter investigated the influence of Virtual World courseware on usability (in terms of user perception and satisfaction) as well as learning performance in an online interface. This investigation has been carried out by developing two different versions of the courseware as an experimental platform. The first version was based on two-dimensional (flash) courseware in teaching the cupping lesson as learning material. Meanwhile, the second version was based as metaverse (3D Virtual World) to deliver the same learning material. Both online learning platforms were then empirically evaluated by two independent groups of users. The first group (control) tested the two-dimensional (flash) interface while the second one (experimental) tested the metaverse (Virtual World) interface in learning cupping subject and answering some questions in a test section.

The results obtained from this experiment confirmed that the courseware in the metaverse (Virtual World) could indeed usable and satisfied student by adding the four sections of OTQT. In other words, it can be concluded that the tested metaverse (Virtual World) courseware and OTQT framework could statistically significantly contribute in enhancing the usability of the online learning interface in term of perception (ease of use, efficacy, aesthetic and presence) and user satisfaction but not on user performance. This might due to the low text readability inside tutorial and test sections. Therefore, the courseware in the metaverse (Virtual World) and OTQT framework is suggested and the reason of the problem (lower performance) need to be investigated further.

CHAPTER 6

EXPERIMENT III: The Usability of Video Segment in Tutorial Section of OTVQT framework in the courseware of 3D Virtual World

6.1 Introduction

The second experiment had shown that developing healthcare module courseware with multisection of OTQT (objective, tutorial, quiz and test sections) in the online 3D Virtual World was indeed usable. The VWC2 showed the need of enhancement on text readability. If the information was placed over very busy and textured background in virtual reality application, it will affect the readability of the text (Leykin, 2004). Therefore, in this experiment, the video presentation segment was added as an enhancement to the tutorial section and hope to improve the performance which believed was caused by poor text readability in VCW2. Meanwhile, this third experiment aims to investigate the usability and the role of the video presentation segment of OTVQT (objective, tutorial with video, quiz and test) added in 3D Virtual Worlds online learning environment of VWC3 (Virtual World Courseware III) which the second experiment lack of . It also assumed that video presentation in the third experiment can improve the text readability.

6.2 Aims, objectives and hypotheses

This third experiment's aim is examining the usability (in terms of effectiveness, perceptions and user satisfaction) of online learning interfaces that incorporate the use of video technology in the presentation of alternative medicine (cupping) lesson module. More specifically, it's aimed at examining the effectiveness of video technology in delivering supportive training material to the lesson tutorial in the Virtual courseware.

In order to accomplish the aforementioned aims, the following objectives were needed to be achieved:

1. Implementation of an experimental online learning platform that employs video added technology in a Virtual World courseware.
2. Empirical evaluation of the VWC3 by one group of users.
3. Measuring the users' learning performance by calculating the percentage of correct questions successfully answered by users in VWC3 platform.
4. Measuring the perceptions by positive questions average ranking of VWC3 platform.
5. Measuring the satisfaction of users by their responses to questionnaire dedicated to asses user's attitudes in relation to the applied courseware in an online learning platform.

The second experiment had shown that developing courseware with multisection of OTQT (objective, tutorial, quiz and test sections) was usable and could increase users' performance. However, it was suggested that the VWC (virtual world courseware) should have clearer text instructions. Therefore, to proove that indeed text readability had caused less performance and affect readability in the second experiment, the video presentation segment was added in this experiment. It was assumed that the addition of video technology in VWC3 would increase the usability level and users' learning achievement (Gorini, 2008) of OTVQT multisection in an online 3D Virtual World learning platform. Therefore, the role of newly design multisection of OTVQT in VWC3 was analysed and compared with OTQT of the VWC2.

Figure 6.1 below shows the flowchart of third experiment and based on this assumption, the following hypotheses were derived:

H1: Users of VWC3 will express high positive views towards the use of video technology.

H2: The addition of video technology in VWC3 will result in enhancing users' learning performance in terms of questions correctly answered percentage.

H3: On overall, users will be satisfied with VWC3.

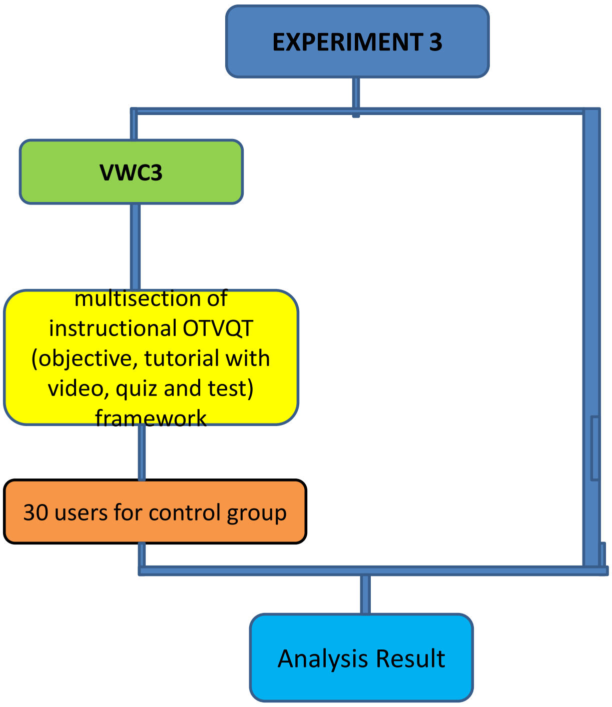


Figure 6.1: Flowchart of third experiment

This third experiment investigates the usability of video segment (Appendix C2) added to the tutorial section of OTVQT (objective, tutorial with video, quiz and test) in 3D Virtual Worlds online learning environment of VWC3 (Virtual World Courseware III). One platform (VWC3) was created with the similar VWC2 template where the video presentation segment was added to check their learning performance and usability. 30 users in the experimental group were involved in this experiment. The result of the video section was analysed according to user perception (ease of use, efficacy and aesthetic), performance and satisfaction. The performance of the groups was analysed by test assessment.

6.3 Experimental platform

The VWC2 with OTQT framework used in the previous experimental work demonstrated as usable as standard 2DC of flash courseware regarding both usability and users' achievement. However, in terms of satisfaction, VWC2 with OTQT framework was more satisfying and preferred than 2DC courseware. Meanwhile, Virtual World courseware with OTQT framework did not utilize video presentation segment that that can be applied in the courseware. Thus, these experimental outcomes established the need for further enhancements in the VWC2 platform to investigate if the addition of video (audio-visual) could enhance users' performance in Tutorial Section as well as Test Section. Figure 6.2 below shows the video presentation scene in 3D Virtual World (VWC3).

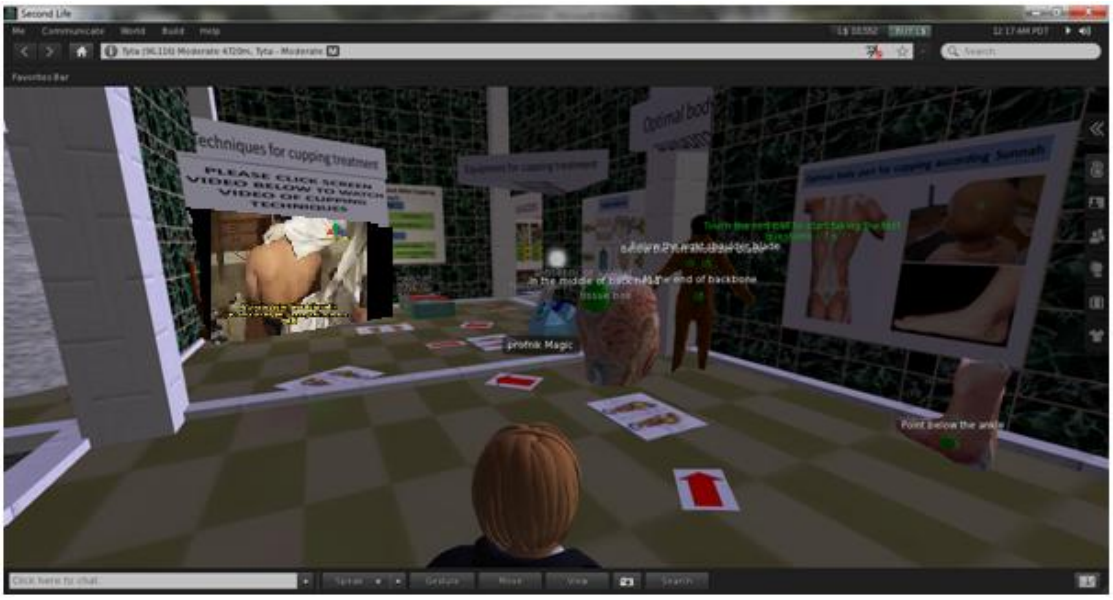


Figure 6.2 shows the video presentation scene in 3D Virtual World (VWC3).

Previous experimental studies showed the potential of video in improving the usability (Hartsell, 2006) and learning performance (*Summerfield, 2007*). Also, video plays a bigger role of communicating information in fully immersive 3D environment user interfaces (Laws, 2010). Therefore, the experimental online learning platform (VWC3) designed to carry out this investigation, was replicated and extended from the VWC2 by involving video (audio-visual) presentation element to enhance the understanding and memorization of the learning information and content when delivered through the Virtual World environment. In other words, the use of audio-visual presentation metaphors (video) was the only feature distinguished the VWC3 from VWC2. Three video (audio-visual) lessons were used in the VWC3 platform to capture users' attention towards key parts of the learning content while being presented by the 3D environment of experienced learning. It can be seen that VWC3 were divided into four main sections which similar to VWC2 and 2DC. They are, Objective Section, Tutorial Section, Quiz Section and Test Section. Meanwhile, the video (audio-visual) presentation element was added in the middle Tutorial Section of VWC3. Table 6.1 below shows the mapping between Cupping Treatment course learning material and video (audio-visual) element used in the Tutorial Section of VWC3.

Table 6.1: Mapping between Cupping Treatment course learning material and video (audio-visual) element used in the Tutorial Section of VWC3.

Video element in Tutorial Section of VWCW							
	Types of Cupping	Cupping Techniques	Cupping Benefits	Cupping Equipments	Optimal Cupping Times	Optimal Body Parts for Cupping	Preparation Before and After Cupping Treatment
Video		√		√		√	

6.3.1 Learning material

The introductory lesson about cupping treatment was used in this experiment (VWC3) which is similar to VWC2. The knowledge contained in this VWC3 was about general cupping types, cupping techniques, cupping benefits, cupping optimal times, cupping optimal body parts, cupping basic equipments and preparation (before and after cupping treatment). The detail were explained in video segment (appendix C2) of tutorial section which were about cupping techniques procedures, cupping equipment used and optimal body parts for cupping treatment. Table 6.2 below shows the courseware lesson difference in VWC2 and VWC3

Table 6.2: Courseware lesson difference in VWC2 and VWC3

Lesson	**VWC2**	**VWC3**	
		Normal	**Video**
cupping types	✓	✓	
cupping techniques	✓	✓	✓
cupping benefits	✓	✓	
cupping optimal times	✓	✓	
cupping optimal body parts	✓	✓	✓
cupping basic equipments	✓	✓	✓
preparation before and after cupping treatment	✓	✓	

6.3.2 Implementation of video (audio- visual) in VCW3

Video (audio-visual) presentations used in this experiment were utilised to present the importance learning information of techniques and procedures in the cupping treatment lesson module when presented in the Virtual World. The design of these video presentations was based on the introduction of Cupping Treatment lesson modules. The structure of these video (audio-visual) presentations is shown in Table 6.3.

Table 6.3: Structure of video (audio-visual) presentation framework used in VWC3 to present an Introduction of Cupping Treatment learning subject module.

Video Presentations Framework of Cupping Treatment Introduction in VWC3					
Title	Objective Section	Tutorial Section		Quiz Section	Test Section
		3DVLE	Video		
Cupping types	√	√		√	√
Cupping techniques	√	√	√	√	√
Cupping benefits	√	√		√	√
Cupping optimal times	√	√		√	√
Cupping optimal body parts	√	√	√	√	√
Cupping Equipments	√	√	√	√	√
Cupping Preparations	√	√		√	√

This experiment also utilised simple buttons of video presentations such as play, pause and stop buttons. As shown in the Table 6.4 and Figures (6.3, 6.4 and 6.5), the durations of the first video presentation was 9.57 minutes, the second video presentation was 10.00 minutes and the third video presentation was 9.35 minutes. Also, the subtitle was used to enhance the presentation of the information in the VWC3.

Table 6.4: Video (audio-visual) streaming presentation titles and durations.

Video Presentations of Introduction of Cupping Treatment			
Title	optimal body parts	basic equipments	techniques and procedures
Durations	9.57 minutes	10.00 minutes	9.35 minutes

The video presentations were composed according to the three subjects of Cupping Treatment lessons which overall had seven lessons. These video (audio-visual) presentations were located in the Tutorial Section (second section) of Virtual Courseware framework. The first video presentation was about optimal body parts of cupping treatment according to the Sunnah, the second video presentation was about cupping treatment basic equipments and the third video presentation was about the cupping techniques and procedures. However, only three subjects were introduced in these video (audio-visual) presentations. Also, these video presentations were relatively short and simple to facilitate the subject learning message.

Figure 6.3: The first video presentation of optimal body parts for cupping treatment.

Figure 6.4: The second video presentation of basic equipment for cupping treatment.

Figure 6.5: The third video presentation of techniques and procedures for cupping treatment.

All video (audio-visual) presentations were played once during the presentation of this VWC3 platform. These videos (audio-visual) presentation platform and subjects were selected due to the potential of establishing the content presentation (Frick, 2002 and Means, 2009) of VWC2 framework and expected to increase the performance due to the problem of text readability in the VWC2. 3 video presentations were suitable for the skill practise of health care (Herrington, 2003) as shown in this Cupping Treatment techniques teaching. If the inserted segment of video presentation could produce usability, then the framework of OTQ, OTQT and OTVQT can be suggested in creating courseware in the Virtual World.

6.4 Experimental design

Comparison of usability and users’ performance of VWC2 and 2DC online learning platform was tested in the second experiment reported in Chapter 5 which used two groups of users. However, only one group of users was involved in this experiment to evaluate the addition of video presentation in the VWC3. Although different tasks were designed in this empirical investigation, it was believed that the obtained results could serve a result of the video addition in VWC3 in terms of usability and users’ learning performance. In total, 30 users participated in the experiment individually.

6.4.1 Procedure

Throughout the experiment, the same procedure was followed with each user. At the beginning of the experiment, each user was requested to read the introductory message of the questionnaire and to provide personal data in relation to age, gender, educational level and course. In addition, each user had to tell about prior experience in Computers, Internet, Web, Flash, Web, CD-ROMs, video, stand alone, 3D program and online 3d virtual world. Then, a brief demonstration video (30 seconds) about the tested platform was presented. In the following, a short training for 45 seconds was provided in which each user had the opportunity to listen to the implemented Virtual World Courseware video presentation. The aim of this training was to insure users' ability to understand and interpret each of the instruction and go through explorative learning easily. Upon completion of the training period, each user had to learn by going through the explorative study of Cupping Treatment through the Video Virtual World Courseware. The VWC3 still have similar four sections such as VWC2. However, in the Tutorial Section, video presentations were added. The users had to go through and understand the learning objectives of the Objective Section. Afterwards, the user had to perform the required tasks through explorative learning and training in the Tutorial and Quiz Sections. Then, the user had to answer the test questions in the Test Section. Subsequently, the last part of the experiment was devoted to obtaining users' opinion regarding the use of the program. There was additional of video presentation in the VWC3 compared to VWC2. This can be seen in the shading area in the Table 6.5.

Table 6.5: Procedure followed in conducting the VWC3 of third experiment

30 Users						
Pre-experimental questionnaire						
Tutorial for learning in Second Life						
Objective Section						
1	2	3	4	5	6	7
Tutorial Section						
1	2	3	4	5	6	7
Video 1			Video 2			Video 3
Quiz Section						
1	2	3	4	5	6	7
Test Section						
1	2	3	4	5	6	7
Evaluation Questionnaire						
Satisfaction Questionnaire						

6.4.2 Tasks

The required tasks were grouped into three categories; learning performance task on summative evaluation, users 'satisfaction and perception tasks on descriptive evaluation. Each user had to answer seven questions related to the exploration and presented learning content in order to measure the effectiveness of the interface as well as the learning gained by users from presenting material. These questions were from seven lessons given in the Tutorial Section with additional lesson of cupping techniques, optimal body parts and basic equipment in video presentations. The test was given after the student gone through Quiz Section in enhancing their learning knowledge and memories. Finally, the last task was aimed to obtain the users' attitude towards the tested platform by responding to the perception and a satisfaction questionnaire consisting of several statements on a 5-point and 2-point Likert scale. In the questionnaire task, the views about the four sections in the Virtual World framework were taken similar to the previous experiment in VWC2 of Chapter 5. However, in this experiment, the detail views about the video presentation were added to the questionnaire. All the questionnaires are derived from lessons given in the tutorial section of VWC3. The statements of perceptions and satisfaction section are derived from the general courseware questionnaire. Tables 6.6 and 6.7 below show how the implemented video presentations were utilised to deliver the information needed in answering the required questions (techniques) correctly.

Table 6.6 shows the summary of the required tasks in the third experiment.

Task Category	**Task Description**
Learning performance tasks	Answer 7 questions related to 7 lesson tutorial
Satisfaction tasks	Respond to satisfaction questionnaire
Perception tasks	Respond to perception questionnaire

Table 6.7 shows the relation of the video presentations to the Cupping Treatment questions and sections.

	Performance questions							Satisfaction questions	Perception questions			
Question (Q) and section (S)	Q1	Q2	Q3	Q4	Q5	Q6	Q7		S (O)	S (T)	S (Q)	S (T)
Video presentations				√	√		√	√		√		

Video buttons such as play, pause, resume and volume was used to deliver cupping techniques lesson which are included in the Tutorial Section of Virtual World Courseware. It can be noticed that the question number 4, 5 and 7 were related to the video presentations. However, the remaining four questions were related to the lesson 1, 2, 3 and 6 in the Tutorial Section of VWC3. Therefore, the result of questions 4, 5 and 7 in the test section and perception of tutorial section was much related to the video presentation segment in the Tutorial section of VWC3 framework.

6.4.3 Dependent variables

Three dependent variables were considered in this experiment and briefly in Table 6.8.

DV1: Video Evaluation: Positive opinion towards video lessons in tutorial section.

DV2: Correctness of users' answers to the evaluation questions in the test section: measured by calculating the number and percentage of correctly answered questions.

DV3: User overall satisfaction: measured by users' responses to the overall satisfaction questionnaire.

Table 6.8 shows the dependent variables used in the third experiment.

Variable code	**Variable**	**Measure**
DV1	More or equal to two third positive opinion towards video section (≥ 67%)	Perception
DV2	More or equal to two third correctness of users' answer (≥ 67%)	Users' learning performance
DV3	More or equal to two third of user satisfaction (≥ 67%)	Satisfaction

6.4.4 Controlled variables

The controlled variables in this experiment were:

CV1: Required tasks: about the same tasks were required for all users.

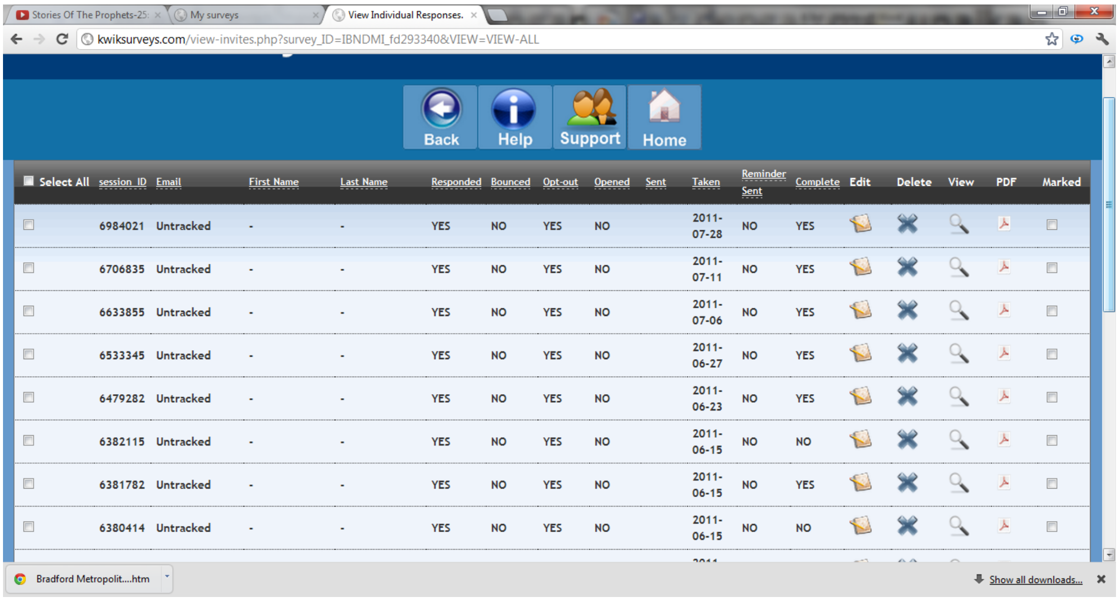
CV2: Learning material: Except the video addition, the information presented about cupping treatment lesson was similar to VWC2 version.

CV3: Awareness of questions: the experiment has been conducted by the same experimenter on an individual basis with each user. Also, the same procedure was followed during the execution of the experiment including measurement tools and used equipments.

CV4: Familiarity with the interface: all the user, were first-time users of the tested interface with the same level of training.

6.4.5 User sampling

The participation of 30 users in VCW3 could be sufficient to provide the usability evaluation (Nielson 1993) and too many participants require longer research time. The selection of the participants was based on their non-prior knowledge in the learning topic namely alternative health lesson module of Cupping Treatment. In this regard, the majority of the users in the group had no experience indicating that they will rely only on the presented learning material to answer the required questions. The date and time then set for each of volunteer students. The experiment and data collection were done by the 30 users of the experimental group (VWC3) were reached with no missing data occurred. The data analysis involved both results from VWC3 (OTVQT) and VWC2 (OTQT). Figure 6.6: shows the questionnaire results for experimental group (VWC3) and date taken.



Select All	session_ID	Email	First Name	Last Name	Responded	Bounced	Opt-out	Opened	Sent	Taken	Reminder Sent	Complete	Edit	Delete	View	PDF	Marked
	6984021	Untracked	-	-	YES	NO	YES	NO		2011-07-28	NO	YES					
	6706835	Untracked	-	-	YES	NO	YES	NO		2011-07-11	NO	YES					
	6633855	Untracked	-	-	YES	NO	YES	NO		2011-07-06	NO	YES					
	6533345	Untracked	-	-	YES	NO	YES	NO		2011-06-27	NO	YES					
	6479282	Untracked	-	-	YES	NO	YES	NO		2011-06-23	NO	YES					
	6382115	Untracked	-	-	YES	NO	YES	NO		2011-06-15	NO	NO					
	6381782	Untracked	-	-	YES	NO	YES	NO		2011-06-15	NO	YES					
	6380414	Untracked	-	-	YES	NO	YES	NO		2011-06-15	NO	NO					

Figure 6.6: : The questionnaire results for experimental group (VWC3) and date taken.

6.5 Data Collection

Two main resources were utilised in collecting the obtained data; test and questionnaires (refer appendix C1). Users' responses to the pre-experimental (appendix C1-section A) part of the questionnaire helped in gathering the data in relation to the individual characteristics of the participants in terms of personal information and previous experience of learning technology. However, users' answers to the test were evaluated to attain the data related to the effectiveness and learning performance. Furthermore, the post-experimental (appendix C1-section B, C and D) part of the questionnaire was devoted to obtaining users' feedback with respect to the implemented of video (audio-visual) presentation in the Tutorial Section of the Virtual Courseware and users' satisfaction of the whole VWC3 presentation.

6.6 Users Profiling

The test sample consisted of 30 users participated in the experiment on an individual basis. All of them were volunteers and first-time users of the experimental platform. Figure 6.7 shows users profiling in terms of personal data and experience (appendix C3).

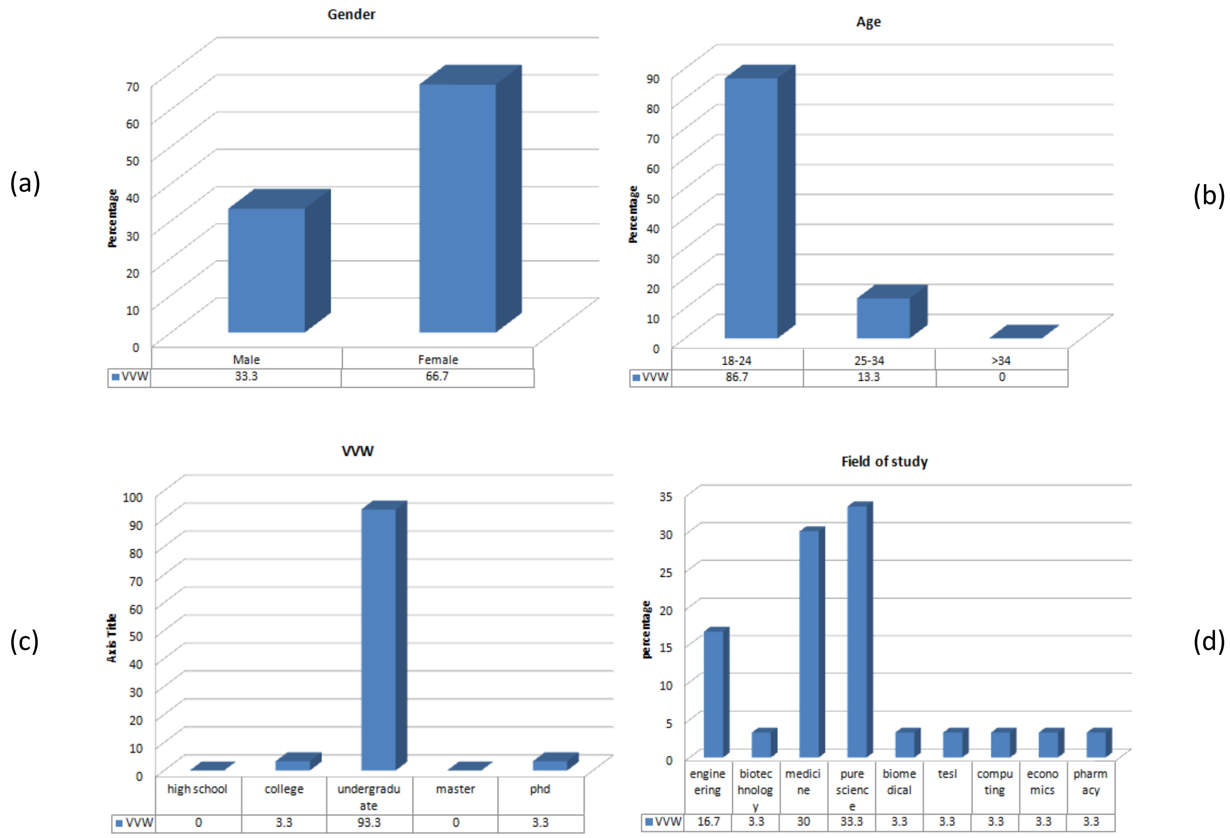
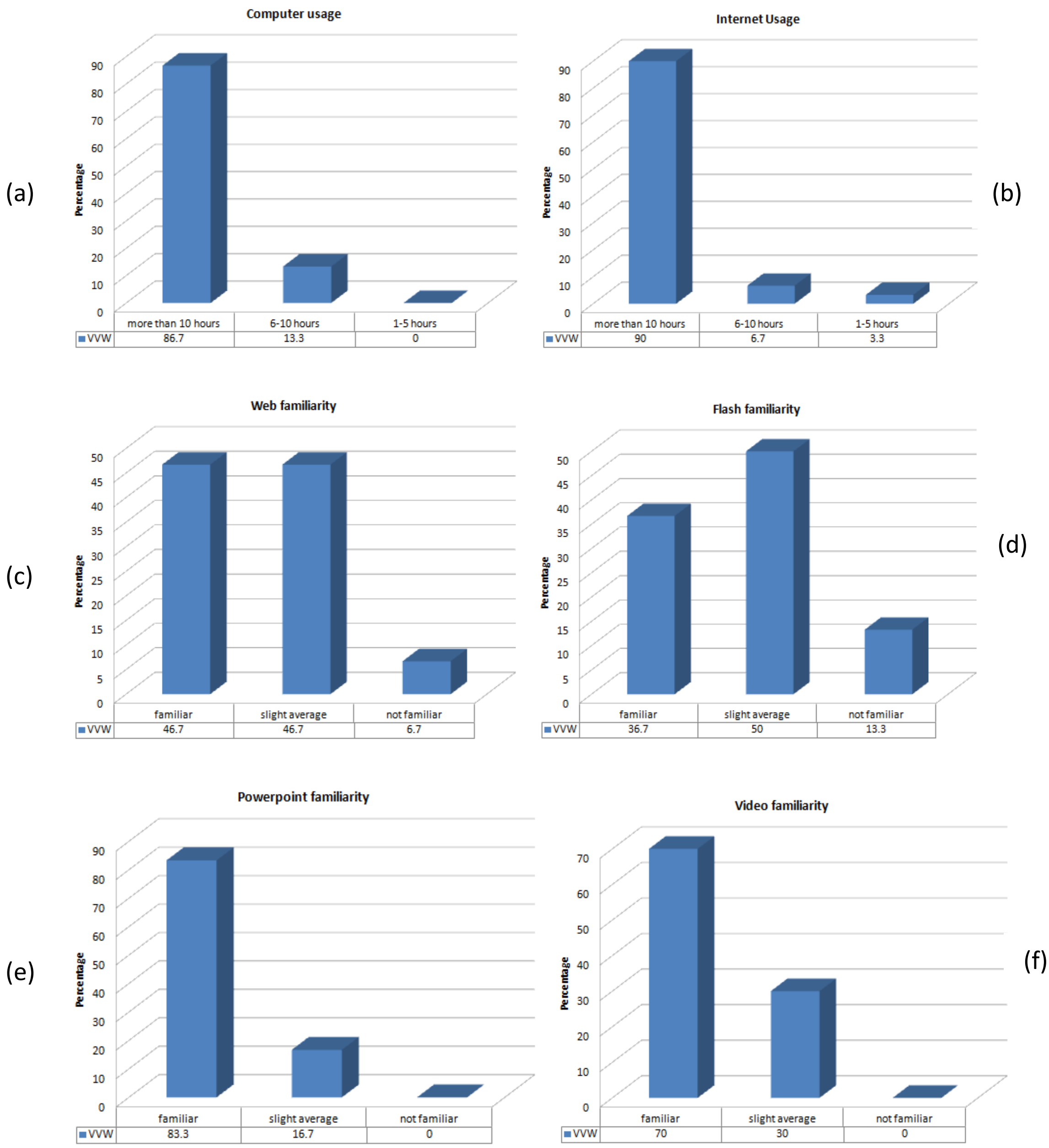


Figure 6.7: Profile of users in terms of personal data.

As shown in Figure 6.7, most participants (86.7%) were from the age range 18-24 year old and the remaining 13.3 % (4 users) were 25-34 years old. The users' gender was observed as 66.7% (20 users) female and 33.3% (10 users) male. Furthermore, most of the participants (93.3%) were enrolled in undergraduate course compared to Master, doctorate and diploma course. Also, the largest percentage (74.3%) of users were studied in medicine, health and science courses while only 25.7% were student from other courses. The other areas of study were engineering, computing, literature and economics with 16.7%, 3.3%, and 3.3% respectively. Figure 6.8 shows profile of users in terms of previous experience.



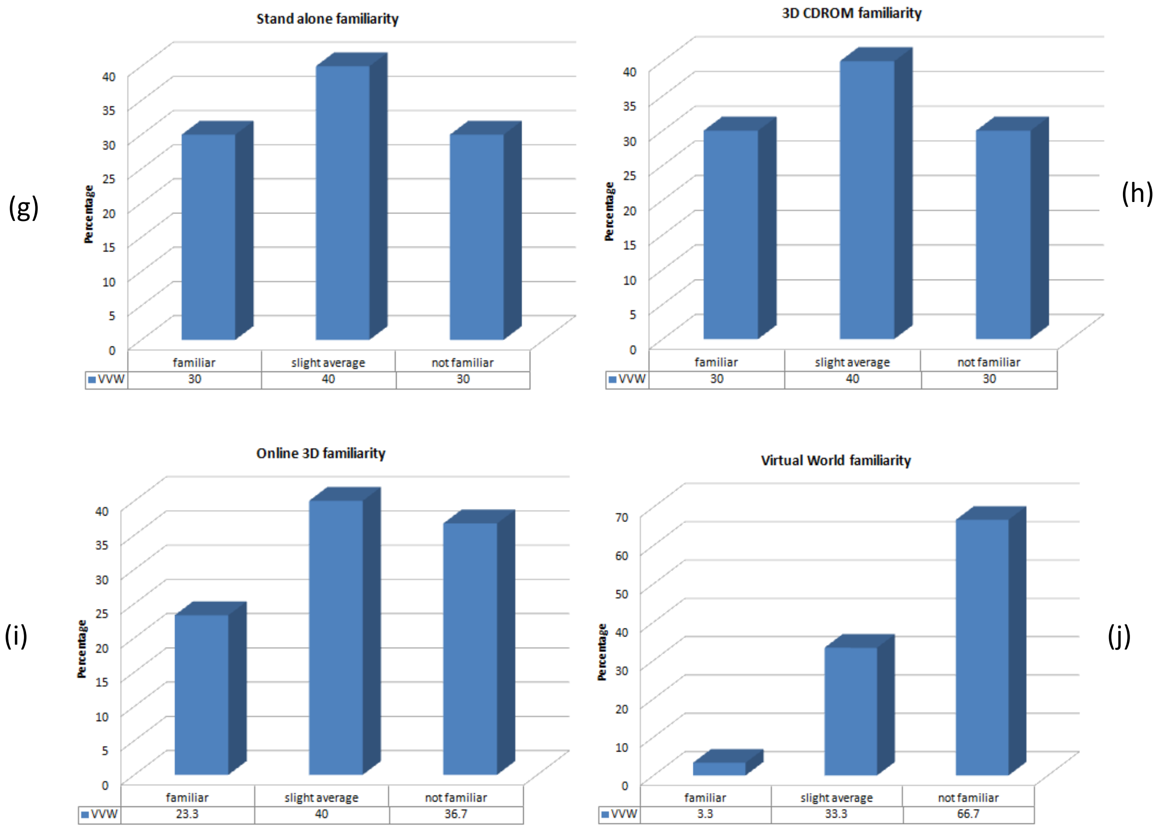


Figure 6.8: Profile of users in terms of previous experience.

In terms of prior experience, figure 6.8 demonstrates that users used more than 10 hours weekly on computers (86.7%) and Internet (90%). Meanwhile, users were familiar with multimedia and information technology presentation such as web (93.3%), flash (86.7%), PPT (100%), video (100%), CD-ROMs (70%), and online 3D Games (63.3%). When users were asked about their knowledge in 3D Virtual World programme, the learning material used in this experiment, 63.3 % (19 users) of them declared that they were totally not used to it, 33.3% (10 users) have limited experience and only 3.3% (one user) had good knowledge on the topic. In the other words, an overwhelming 97.7% of the users were inexperienced in this regard. In total, 91.7% of the users used multimedia and information technology application with different time intervals per week whereas the remaining did not experience it at all. Appendix C3 provides more details about the characteristics of the users who participated in the VCW3 of the third experiment.

6.7 Results

The obtained experimental results were analysed in terms of different parameters including users views regarding the video segment incorporating in the Tutorial Section of multisection VWC3. Also, these parameters involved measures of the number of correct to incorrect users' answers (effectiveness) and user satisfaction. The existence of significant difference in users' responses was examined by the nonparametric Chi-square statistical test at $\alpha = 0.05$ indicating a significant difference when the p-value was found less than 0.05.

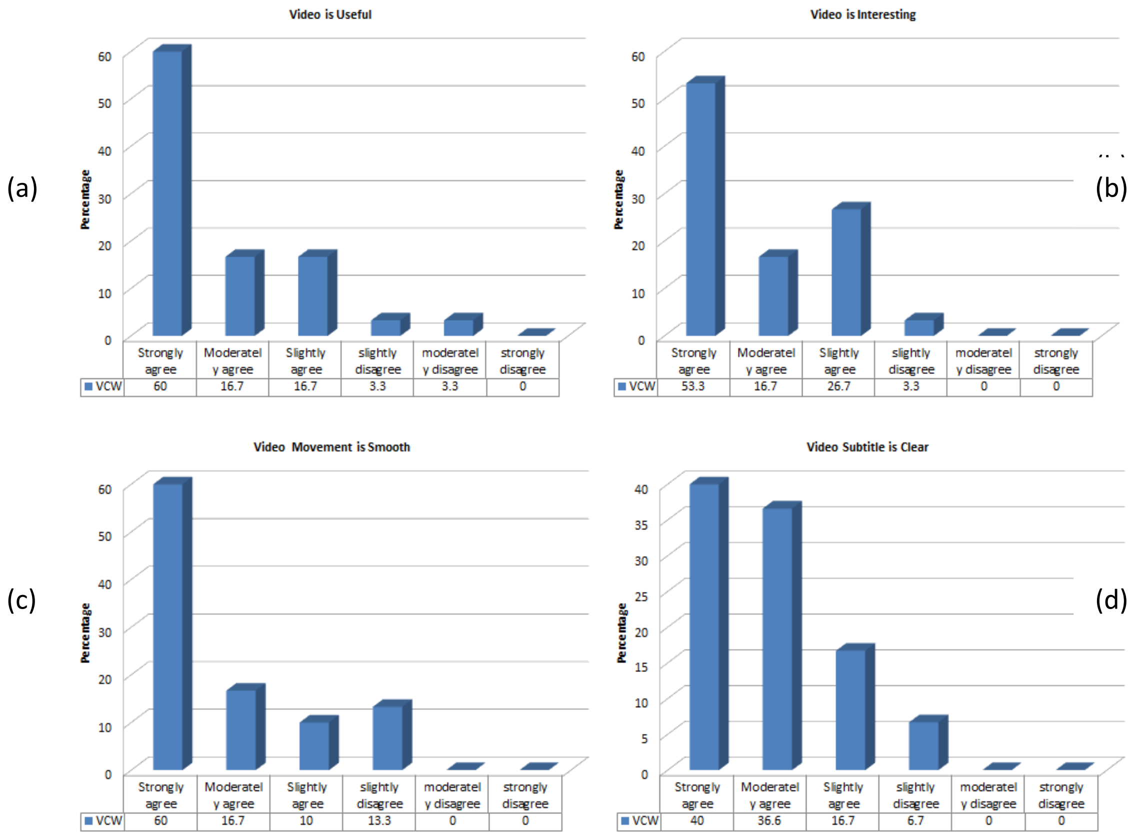
6.7.1. Users' perceptions of video (audio-visual) segment

Prior to the experiment, users were asked about their experience with video presentation and all of them familiar with it which is 70% very familiar and 30% slight familiar. Then the students have experienced the learning and answer the use of a video presentation of the Cupping Technique in the Tutorial Section of VWC3 in an online learning interface. Users were required to respond to the perception questionnaire composed of 13 statements each of which had a 6-point Likert scale with 1 representing strong disagreement and 6 representing strong agreement. It can be seen that users' feeling was more positive (5.2752 on Likert scale and

87.92%) when video presentations were used collaboratively in the Tutorial Section of VWC3. It can be noticed in Figure 6.9 that the positive statements (a, b, c, d, e, f, g and l) attained high levels of user agreement (between 75.9% and 97.3%). Figure 6.9 shows users responses on video presentation in VWC3.

Table 6.9 shows the statistical result of the 1st hypothesis.

First Hypothesis	**Result**
Users of VWC3 will express high positive views towards the use of video technology	The video presentations gain positive perceptions where more than three quarters (87.92%- from overall perception result) of users express positive expressions.



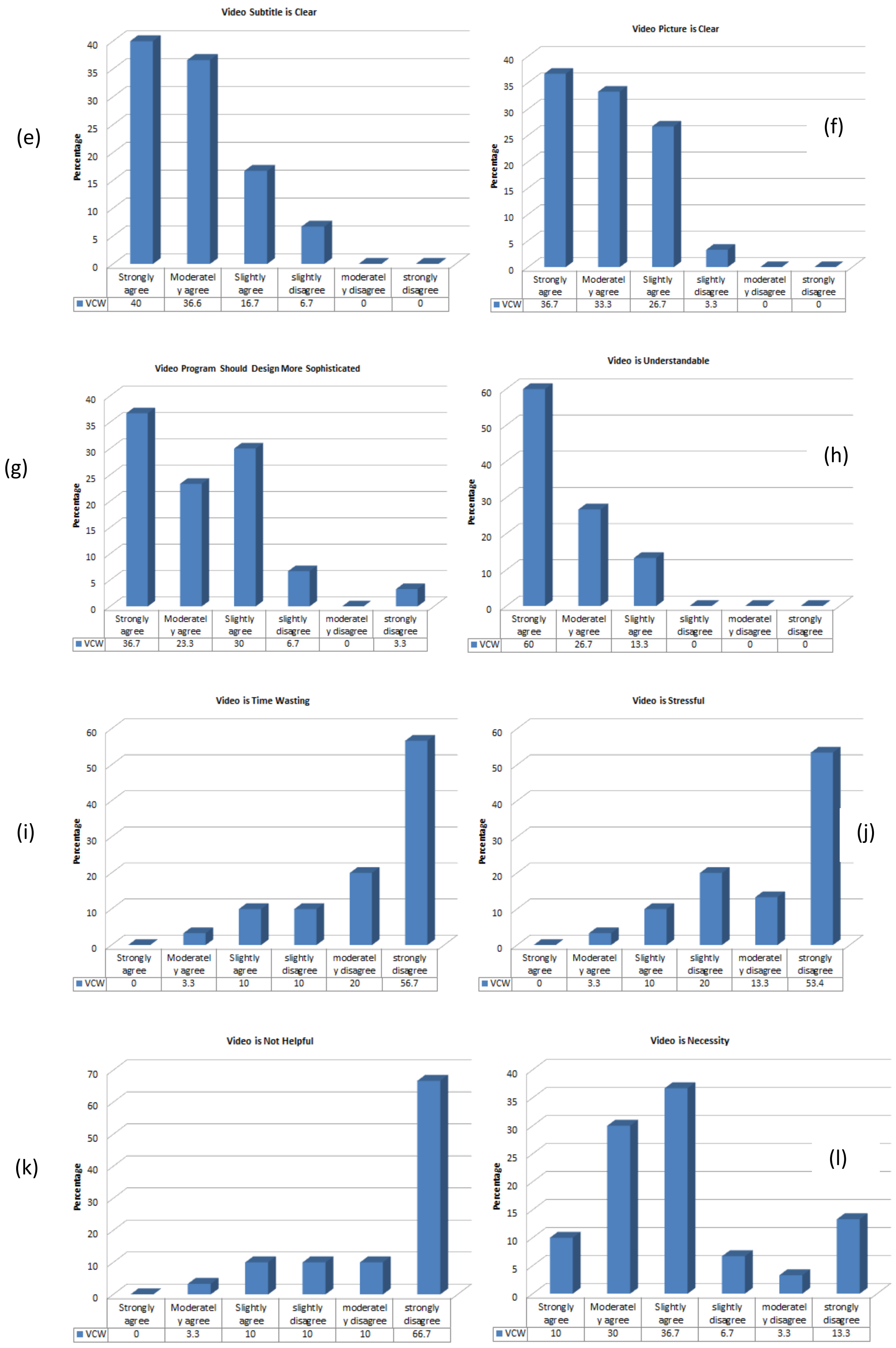


Figure 6.9: Users responses on video presentation in VWC3.

More specifically, most of users agreed that the video presentations were *useful* (90%), *interesting* (93.7%) and *understandable* (96.7%) respectively. However, this percentage decreased to 83.3% for user perception of *smooth video movement*. The percentage rose again to 90% for *clear subtitle, clear sound* (96.7%) *and clear video picture* (93.3%). On the other hand, users' disagreement regarding negative statements (P8, P10, P11 and P12) was observed high (86.7%) except for *sophisticated design*. According to most of the users (83.3%), the video presentations were neither *time wasting*, *stressful* nor *unhelpful* while *the design should be more sophisticated* (90%). The last statement investigates the necessity of the video presentation inserted in the Tutorial Section of the Virtual World courseware. The users think that the video presentation is *necessary* but not too much (73.3%). On the whole, the video presentations gain positive perceptions where more than three quarters (87.92%) of users express positive expressions. In summary, the addition of video presentations to the experimental online learning Virtual World courseware were useful, interesting, helpful, the movement is smooth, the subtitle, the picture and sound is clear, up to date program, understandable, not time wasting neither stressful but not too necessary.

6.7.2 Effectiveness

The measure of correct to incorrect answers in the Test Section was used to assess users learning performance as well as the effectiveness of the VWC3 in presenting the learning material. Each user was required to answer the same 7 questions from 7 topics given. Therefore, the total number of questions was 210 (30 user * 7 questions per user). Table 6.10 shows the statistical result of the second hypothesis and figure 6.10, 6.11 and 6.12 show the percentage of correct and incorrect answers achieved by users for all questions, grouped by correct and incorrect answers and for each question.

Table 6.10 shows the statistical result of the 2nd hypothesis.

Hypothesis 2	**Result**
The addition of video technology in VWC3 will result in enhancing users' learning performance in terms of questions correctly answered percentage	The overall percentage of correct answers was 90.5%.

Figure 6.10 shows the frequency attained by users for percentage of correct answers related to the presented learning test. It can be observed that 60% of users answered all questions correctly, 33.3% of user accomplished 85.71% of correct answers and both other 3.3% of users achieved 71.43% and 41.86% of correct answers respectively. In other words, 93.3% of users correctly answered 6 or more questions, which could be regarded as high performance rate compared to VWC2 which was 66.67%.

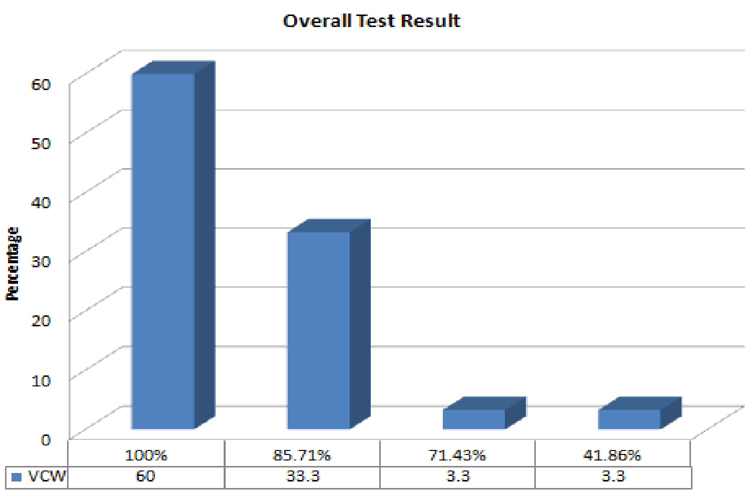


Figure 6.10: Overall test result.

It can be seen as shown in figure 6.11 below that the overall percentage of correct answers was 90.5% compared to 9.5% incorrect. This overall percentage performance result is higher than VWC2 which was 81.9%. In other words, 190 out of 210 questions were correctly answered. These results were highly significant (χ^2 (1) = 179, CV= 3.84, $p < 0.05$).

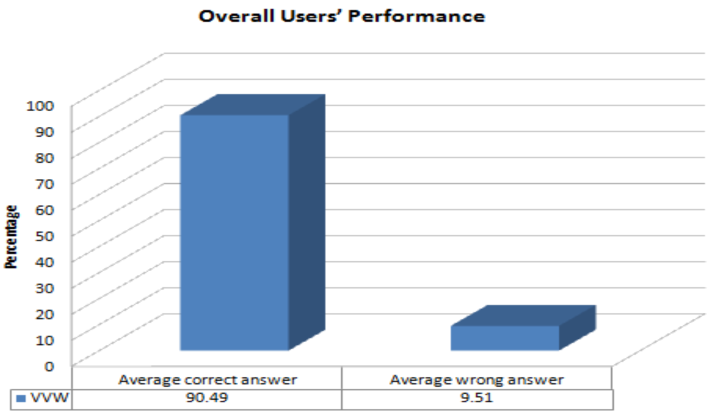


Figure 6.11: Overall users' performance.

Figure 6.12 below shows the correct answers attained by users for each question related to the delivering learning content. It can be seen that users' performance was varied across these questions. More specifically, the percentage of users who correctly answered question 1 until 4 (lesson 1 to lesson 4) were 100% (30 users), 96.7% (29 users) and both 90% (27 users) respectively. However, it seems that the remaining three questions were more difficult to answer. The percentage of correct answers declined from 86.7% (26 users) for question 5 (lesson 5) and question 6 (lesson 6) and 83.3% (25 users) for question 7. These results were significant in terms of the difference between correct and incorrect answers for all questions Q1 (χ^2 (1) =24, CV= 3.84, p< 0.05), Q2 (χ^2 (1) =20, CV= 3.84, p< 0.05), Q3 (χ^2 (1) = 17, CV= 3.84, $p< 0.05$), Q4 (χ^2 (1) = 17, CV= 3.84, $p< 0.05$), Q5 (χ^2 (1) = 14, CV= 3.84, $p< 0.05$), Q6 (χ^2 (1) =14, CV= 3.84, $p< 0.05$) and Q7 (χ^2 (1) = 11, CV= 3.84, $p<0.05$). This is shown that all questions were relevant to use in the test section and varies its complexity (Reeves, 2000).

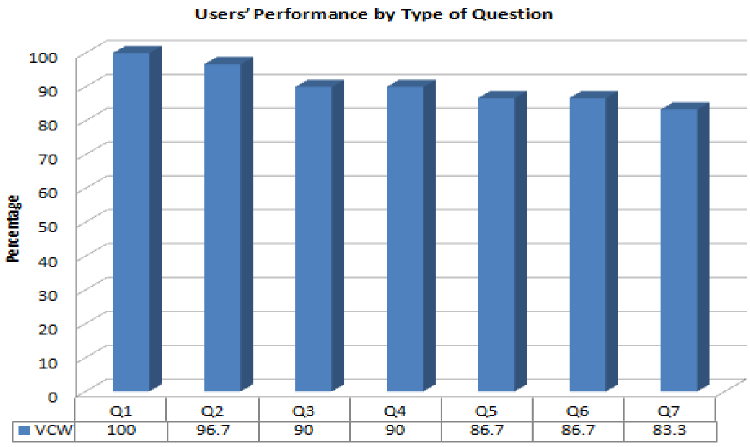


Figure 6.12: Users' correct answer by type of question.

Table 6.11: Chi square results for correctness of cupping treatment test section (df= 1, CV= 3.84)

Lessons	Question No.	χ^2 value	p-value	Significant
Cupping types	Q1	24	< 0.05	Yes
Cupping benefits	Q2	20	< 0.05	Yes
Cupping optimal times	Q3	17	< 0.05	Yes
Cupping basic equipment	Q4	17	< 0.05	Yes
Cupping optimal body parts	Q5	14	< 0.05	Yes
Cupping preparations	Q6	14	< 0.05	Yes
Cupping steps and techniques	Q7	11	< 0.05	Yes

It was obvious (table 6.11, and figures 6.10, 6.11, 6.12) that incorporation of video presentation produce high performance. To summarize, it can be said that the incorporation of well known YouTube video in 3D Virtual World courseware was found to be beneficial in delivering the learning material of 3D online Virtual World learning interfaces and enhance text alone in creating experiences of social presence (Gorini, 2008). In other words, using these video presentations can complement the role of Virtual World Courseware and it is more likely to result in capturing users' attention to key parts of the delivering skill practise learning content (Hartsell, 2006). As a result, it could help in enhancing learners' performance in responding to different lesson's questions. More details about the correctness of users' answers to the learning evaluation questions can be found in Appendix C3.

6.7.3 Users' satisfaction

Upon finishing test task and giving views about video sections, users were required to respond to the overall satisfaction questionnaire composed of 5 statements each of which had a 2-point Likert scale with 1 representing agreement and 2 representing disagreement. Table 6.12 shows the statistical result of the third hypothesis and figure 6.13 shows users satisfaction of VWC3 experience.

Table 6.12 shows the statistical result of the 3rd hypothesis.

Hypothesis 3	**Result**
For overall, users will be satisfied with VWC3 .	User satisfaction score calculated was 91.4%.

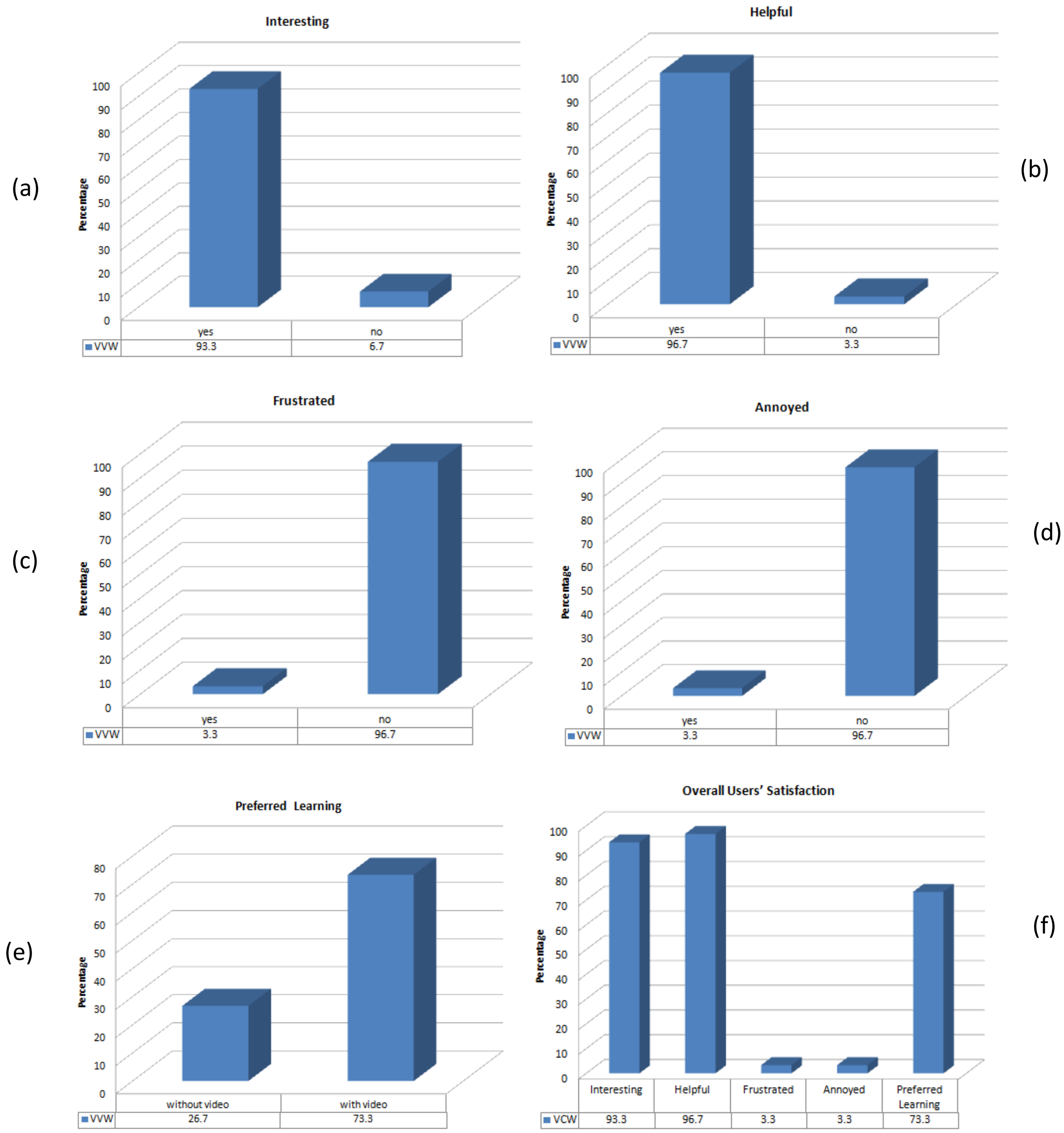


Figure 6.13: Users satisfaction of VWC3 experience.

The 5 statements were used to obtain users' attitude towards the different aspects of the VWC3 and also to obtain feedback from users regarding their learning experience attained during the interaction with the tested online learning platform. On average, user satisfaction score calculated was 91.4% indicating a high positive attitude. Table 6.13 shows users agreement and disagreement frequency of satisfaction statements.

Table 6.13: Users agreement and disagreement frequency of satisfaction statements.

Statements	**Agree (frequency)**	**Disagree (frequency)**
Interesting	28	2
Helpful	29	1
Frustrated	1	29
Annoyed	1	29
Preferred	22	8

The frequency of users' different responses (i.e. agree, disagree) to reach statement in the satisfaction questionnaire is illustrated in Table 6.8 (see also Appendix C3). It can be noticed in Figure 6.13 that the positive statements (1 and 2) in the questionnaire attained high levels of user agreement (93% and 96.7%). More specifically, 93.3% of users agreed that the VWC3 is *interesting* and *helpful* (96.7%).

On the other hand, users' disagreement regarding the negative statements (3 and 4) was observed as high which were both 96.7%. According to the most of the users (96.7%), the interface was neither *frustrated* nor *annoyed*. The additional satisfaction statements explored the users' views with respect to their learning experience in terms of preference about the presented lesson either with video (73.3%) or without it (26.7%). Table 6.14 shows users comments of VWC3 experience.

Table 6.14: Users comments of VWC3 experience.

Overall Comments

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	interesting subject and knowledge	1	3.3	4.8	4.8
	good and nice	2	6.7	9.5	14.3
	slow movement	1	3.3	4.8	19.0
	process understandable	1	3.3	4.8	23.8
	improve the q and a alignments	1	3.3	4.8	28.6
	improve structure and animation	1	3.3	4.8	33.3
	change subject	1	3.3	4.8	38.1

	add sound correct or wrong	1	3.3	4.8	42.9
	add more color	1	3.3	4.8	47.6
	2d is more interesting	1	3.3	4.8	52.4
	improve the 3d	1	3.3	4.8	57.1
	interesting presentation	4	13.3	19.0	76.2
	make more interesting colors like pictures	1	3.3	4.8	81.0
	nice	1	3.3	4.8	85.7
	good	1	3.3	4.8	90.5
	video lenght too long	1	3.3	4.8	95.2
	video in foreign language	1	3.3	4.8	100.0
	Total	21	70.0	100.0	
Missing	System	9	30.0		
Total		30	100.0		

Finally, an open question was given to gather overall suggestions and recommendations. 70% of users give opinions while another 30% not giving any opinion at all. More than one third of users 42.9 % were fully satisfied with the experimental presentation while the other gives suggestions on several parts of presentation such as video length and communication language (Table 6.14).

6.9 Discussion and summary

During the experiment, it was observed that the users understood the delivered learning information. The reason could be attributed to the inclusion of video presentation in the Tutorial Section of the Virtual Courseware. The step by step cupping techniques were provided in the second lesson of Tutorial Section in the VWC3 through 3D experience learning. At the same time, video (audio-visual) presentation in the Virtual Courseware of the sixth lesson in the Tutorial Section contributed to provide further explanation of Cupping Treatment according to the Sunnah. What is more important, using the video (audio-visual) presentation provided users with an additional mechanism in enhancing understanding and learning performance. Also, it helped them to recognize the equipment used and understand the rules with the technique arrangement in doing the real Cupping Treatment shown by the tutor in the video session. The obtained result showed that the featured in the video session did not annoy, frustrate or distract the users and they found it helpful and interesting. Also, users were able to remember, process and analyse the information given in the Tutorial Section. Therefore, when users were asked about the presented learning material, they were able to provide the correct answer in Figure 6.10. As a result, they were satisfied with the video presentation in the Virtual World courseware. Table 6.15 shows the overall statistical result of the usability and the role of OTVQT framework in VWC3.

Table 6.15 shows the overall statistical result of the usability and the role of OTVQT framework in VWC3.

Usability and the role of OTVQT in VWC3	**Statistical result**
Users of VWC3 will express higher positive views towards the use of video technology compared to VWC2.	The video presentations gain positive perceptions where more than three quarters (87.92%) of users express positive expressions and a little bit higher than VWC2 (87.86%).
The addition of video technology in VWC3 will result in enhancing users' learning performance in terms of questions correctly answered percentage compared to VWC2.	The overall percentage of correct answers for VWC3 platform was 90.5% compared to 81.9% of VWC2.
For overall, users will be more satisfied with VWC3 compared to VWC2.	User satisfaction score calculated was 91.4%.

The second experimental hypothesis (H2) examined the effect of the added video (audio-visual) in the Tutorial Section of VWC3 on users' learning performance. The findings of this experiment demonstrated that users' performance was significantly assisted by the addition of video (audio-visual) presentation and helped in extending the contribution of Virtual World courseware. However, it is worthy noting that the contribution of the video (audio-visual) presentation was varied across various online learning platforms (*Alseid*, 2010).

The results of the experiments indicated that the users were satisfied, to a large extent with the inclusion of video (audio-visual) presentation in the Tutorial Section of the VWC3 of an online learning platform. The majority of users stated that these video presentations were interesting, preferred and helpful which neither annoying nor frustrated (See Figure 6.10). Despite the short training and explanation provided prior to the experiment, users also were able to do the leaning in a short time and without hassle. This could be referred to the instructional design used in the Virtual Courseware. Also, the use of video presentation was selected to help in making the teaching and learning of cupping treatment more interesting and understandable. Furthermore, each of video presentation contains only one lesson at one time and helps enhance the understanding of the lessons given. These aspects are important particularly when is incorporated in parallel with the four sections framework of OTQT. These aspects, in addition, led to generate positive users' feelings with respect to the tested VWC3 learning platform. In sum, these results supported assumption made by the experimental hypothesis of H3. As a whole, the obtained results suggest that utilising video (audio-visual) in the Tutorial

Section of VWC3 could be useful in enhancing the usability and learning performance in an online learning interface.

The experiment reported in this chapter investigated the effectiveness and usability of video (audio-visual) presentation of Virtual Courseware. The experiment also investigated users' satisfaction and their learning performance due to the use of this type of addition of video presentation in Virtual Courseware. A total of 30 users have taken part in the experiment to evaluate the experimental online learning platform that extended the one tested in the second experiment by the addition of video presentations. The obtained results demonstrated that the inclusion of these video presentations was effective in capturing users' attention, beneficent features of delivering learning content, and contributed positively in enhancing users' performance in different learning activities. Additionally, these video presentations have shown to be easy to use and were satisfactory to users. Even though there needs some enhancement in term of video length and subtitle, the use of audiovisual streaming was found to be helpful in improving the overall usability of Virtual World courseware and enhanced the poor text readability of online 3D Virtual World environment learning interface.

CHAPTER 7
Conclusions and Future Work

7.1 Main Conclusions and findings

This thesis suggested the guidelines of incorporating multisection (objective, tutorial (with and without video segment), quiz and test) sections in developing a Virtual World courseware. The results taken from three experiments suggesting the guidelines of incorporating those multisection. Table 7.1 shows the main conclusions and limitations of the first experiment

Table 7.1 shows the main conclusions and limitations of the first experiment

First Experiment (Virtual World Courseware with OTQ framework)	
Main conclusions	**Limitations**
1. Effective (user performance). 2. Positive users' perception. 3. Positive users' satisfaction 4. Suggestions are implementable.	1. Internet connection 2. Time constraint 3. Implementation cost

The results obtained from the first experiment showed that the online 3D Virtual World courseware with OTQ framework is usable and can be enhanced in making proper and standard Virtual World courseware. Using a combination of 3D virtual environment with objective, tutorial, quiz and test sections, this courseware is effective in enhancing user performance (refer to Section 4.8.1 and Figure 4.10). This courseware was also found to be usable in term of its high positive user satisfaction (refer to Section 4.9.1 and figures 4.18). Additionally, users are interested in learning through online 3D Virtual World courseware and give suggestions towards enhancement which can be implemented in the next experiment (see Section 4.9.4, table 4.20 and figure 4.19). These findings, however, did not sufficiently shed the light upon the standard courseware in the market which can track user performance on the understanding of delivering learning content. Therefore, the next experiment was designed to provide a test section where the tutor or the student himself could track the student understanding and learning performance of the presented lesson module. Table 7.3 shows the main conclusions and limitations of the second experiment.

Table 7.2 shows the main conclusions and limitations of the second experiment

Second Experiment (Virtual World Courseware with OTQT framework)	
Main conclusions	**Limitations**
1. Positive users' perception of OTQT framework and higher than 2DC. 2. As effective as 2DC. 3. More satisfied than 2DC.	1. Text readability 2. Less multimedia (no audio-visual streaming)

In the second experiment, the obtained results demonstrated that utilising four section framework of OTQT is usable, could enhance performance and contribute to user satisfaction as well as standard 2D courseware. Also, using 3D Virtual World courseware with OTQT framework was shown to be more satisfying than two-dimensional courseware (see section 5.7.3). However, no significant difference in terms of presence criteria can be used in determining which courseware is usable. Additionally, the results from the second experiment helped in determining what instructional designs are beneficial and usable in developing online 3D Virtual World courseware. Nevertheless, these results explained that the contribution of online 3D Virtual World courseware with OTQT framework was restricted to 3D virtual environments and objects which not make use of the audio-visual streaming segment. As a result, further investigation was needed to explore if the addition of a video presentation segment can support the influence and usability of the Virtual World Courseware with OTQT framework. Table 7.4 shows the main conclusions and limitations of the third experiment

Table 7.3 shows the main conclusions and limitations of the third experiment

Third Experiment (Video Virtual World Courseware with OTVQT framework)	
Main conclusions	**Limitations**
1. Effective (higher user performance and confirm poor text readability in VWC2). 2. Higher positive user perception than VWC2. 3. Higher satisfaction than VWC2.	1. Not utilizing MUVE 2. Low real time fidelity simulation

The third experiment provided empirical evidence that the addition of video presentation segments in tutorial section could indeed help in capturing users' attention and enhance the 3D Virtual World courseware interface. These video presentation segments can be effective as a supportive segment to enhance text readability as well as deliver information of the health lesson module in which strengthens the contribution of Video Virtual World Courseware III (VWC3) (see Section 6.7). The results of this experiment also demonstrate that these video presentation segments have a higher positive perception (see Section 6.7.1) and higher satisfaction (see Section 6.7.3).

7.2 Contributions of empirically derived: Multi Section framework design for future courseware

The main findings and conclusions of the reported experiments assist in producing a set of framework design for more usable health course development in a Virtual World environment of an online learning interface that can help learners in enhancing their learning performance. This framework can contribute to the current literature in both areas; online learning and Virtual World course development. This section presents an overall discussion of the set of framework design derived from this research. Table 7.4 shows empirically derived (contributions) for the 3D Virtual World courseware.

Table 7.4 shows empirically derived (contributions) for the 3D Virtual World courseware

Framework	Literature	Design	Empirical
OTQ	Health Courseware	VWC	Usability of VWC
OTQT	Objective, Tutorial, Quiz and Test sections	VWC2	Usability and the role of OTQT in VWC2
OTVQT	Video segment	VWC3	Usability of video presentation in VWC3 to increase text readability

7.2.1 Use of the Objective Section in the Virtual World

The role and usability of objective section study in the second experiment investigated the users' views, satisfaction and performance in regard to 7 objectives given by the cupping treatment lesson tutorial in an online 3D Virtual World courseware. Based on the obtained results (see Section 5.7.1.1), Objective Section incorporated in the program was able to produce an effect (efficacy) and has an artistic beauty (aesthetic) towards an online 3D Virtual World courseware (see Figure 5.23 and Table 5.9). The Objective Section was also found to be easy to use (ease of use) and more like a real environment (presence). The incorporation of the objective section in an online 3D virtual World courseware giving student goals to be achieved at the end of the learning experience make the learning more focus and saving student time. On the other hand, this objective section could be changed in different formats and presentation type which depending on the creativity of instructional and graphic designers.

On the other hand, according to users' comments, too much explanation suggested to be avoided in the Objective Section presentation of an online 3D Virtual World courseware interface (see Table 5.10). Too long sentences also are not recommended where the objectives suggested to be listed and simple. Also, instruction should be clearer about how to go through all the learning experience at the beginning of the Objective Section. However, the Objective Section presentation can overall be considered as beneficial due to significant positive users' views (see Section 5.7.1.1, 5.7.2 and 5.7.3).

7.2.2 Use of the Tutorial Section in the Virtual World

The usability and the role of the Tutorial Section study in the second experiment investigated the user views, satisfaction and performance in regard to 7 lessons given of the Cupping Treatment tutorial in an online 3D Virtual World courseware. Based on the obtained results (see Section 5.7.1.2), the Tutorial Section incorporated in the program was able to present more like a real environment (presence) (see Figure 5.24 and Table 5.14). The Tutorial Section was also found to be easy to use (ease of use) produce an effect (efficacy) and has an artistic beauty (aesthetic) towards an online 3D Virtual World courseware. The incorporation of the Tutorial Section in an online 3D Virtual World courseware may present important information for subject lessons. On the other hand, this Tutorial Section can be enhanced by presenting high-fidelity simulation of the real health treatment session experience.

On the other hand, according to users' comments, irrelevant pictures should be avoided in the Tutorial Section presentation of an online 3D Virtual World courseware interface (see Table 5.18). More information also should be added to the tutorial. In addition, clear and real health 3D environment should be designed. Also, a clear direction of instruction and sound should be added the throughout the Tutorial Section. However, the Tutorial Section presentation can overall be considered as beneficial due to significant positive users' views (Section 5.7.1.2, 5.7.2 and 5.7.3).

7.2.3 Use of the Quiz Section in the Virtual World Courseware

The role and usability of Quiz Section study in the second experiment investigated the users' views, satisfaction and performance in regard to 7 training lessons given by the Cupping treatment lesson quizzes in an online 3D Virtual World courseware. Based on the obtained results (see Section 5.7.1.3), the Quiz Section incorporated in the program was found to very easy to use (ease of use) and able to produce an effect (efficacy) towards an online 3D Virtual World courseware (see Figure 5.24 and Table 5.19). The Quiz Section has a little bit low but still a high art beauty (aesthetic) and real environment (presence). The incorporation of the Quiz Section in an online 3D Virtual World Courseware giving student chance to enhance memory and understanding of the lesson learned in the Tutorial Section. On the other hand, this Quiz Section can be manipulated by presenting a simulation of the real health training session. For example, a training Cupping Treatment session with the patient resembles by avatar.

On the other hand, according to users' comments, more graphic enhancement and sound addition are suggested in the Quiz Section presentation of an online 3D Virtual World courseware interface (see Table 5.23). Also, advanced and more difficult quizzes with simulation should be added in the Quiz Section. However, the Quiz Section presentation can overall be considered as beneficial due to significant positive users' views (Section 5.7.1.3, 5.7.2 and 5.7.3).

7.2.4 Use of the Test Section in the Virtual World Courseware

The usability and the role of the Test Section study in the second experiment investigated the user views, satisfaction and performance in regard to 7 Cupping Treatment questions given in an online 3D Virtual World courseware. Based on the obtained results (see Section 5.7.1.4), the Test Section incorporated in the program was found to be very easy to use (ease of use) and has the high art of beauty. The Test Section in an online 3D Virtual World courseware was also able to produce an effect (efficacy) but low in resembles real test room environments (presence). The incorporation of the Test Section in an online 3D Virtual World courseware may give the student and tutor check the learning and understanding performance of the given subject lesson. On the other hand, this Test Section can be designed in different 3D environments which would resemble the real test situation and location according to the subject learned. For example, diagnosis and surgery on patienst in a real operating room.

On the other hand, according to users' comments, the 3D environment presentation of Test Section should be design more like a real world (see Table 5.25). Furthermore, the language and interface used should be improved. Also, the text and alignment should be obvious and the background used should be more appropriate (text readability). Furthermore, the box used should be clearer and animation should be enhanced. However, the Test Section incorporation in an online 3D Virtual World courseware can overall be considered as beneficial due to significant positive users' views (see Section 5.7.1.4, 5.7.2 and 5.7.3).

7.2.5 Use of the video segment in Virtual World Courseware

Video (audio-visual streaming) presentation inclusion in the Virtual World Courseware was used in this research platform in presenting learning material. These video presentation segments have shown to be an additional component in the interactive Virtual World courseware experience learning interfaces in presenting the learning content. The obtained results demonstrated the significant contribution of the video presentation segment in enhancing text readability and understanding of the health lesson module presented through online 3D Virtual World courseware.

Most of the participants in the third experiment (see Sections 6.7.1, 6.7.2 and 6.7.3) express positive attitudes towards the tested online 3D Video Virtual World courseware (VWC3) platform which means that they were satisfied with the use of the video presentation segment. These results support the findings of previous research (refer to Section 2.4.3.5) which confirmed that the video presentations have a significant effect towards student engagement especially in skills practice. Contrary to avatar or 3D object presentation, video presentations can use real human presentation and can be prepared earlier to fit the instructional needs of course content. For example, different techniques and procedures can be shown in one video presentation program. Therefore, when recording video presentations, instructional designs should be more precise and errors should be avoided. Also, it is recommended to cut short video presentation lenght and show important schedule to avoid fatigue and boredom (see table 6.14).

Furthermore, using video (audio-visual streaming) presentation is suggested to explain difficult procedures step by step as addition to experience learning in 3D environment which similar to a real life operation. This will result in enhancing memory load and offering more resources for cognitive processing of the presented learning material. In brief, using video presentation segment is recommended when designing online 3D Virtual World courseware learning interfaces.

7.3 Future Work

This section proposes ideas for experimental work that can be carried out in the future as a continuation of courseware development in online 3D Virtual World learning environments.

7.3.1 Tutorial and training section with real simulated environment

Realistic simulation can be used in 3D Virtual World training and treatment especially for health and medical education. 3D Virtual World can be used as an alternative tool for teaching medical knowledge and gaining procedural experience through high fidelity patient simulation (Vozenilek et al 2004). For example, in quiz and test section, a student may conduct treatment and surgery to a simulated online patient which resembles real human. Virtual Reality may transfer technical skills to the operating room environment (Seymour 2002) which can be combined with 3D Virtual World. Robotic surgery and medical simulation are important tools which have high impact on patient safety, procedure completion time and cost efficiency (Kunkler 2006). There is tremendous promise for 3D Virtual World in preparing live-patient training through enhanced simulation (Scalese 2008). It is believed that high-fidelity medical simulations are educationally effective and simulation-based education may complement medical education in patient care settings (Issenberg 2005). There were various categories of simulators which can be embedded in future 3D Virtual World courseware such as part task trainers, computer-enhanced mannequins, and virtual reality simulators (Reznek 2002). Virtual Reality can be collaborated with 3D Virtual World courseware which combines surgical simulators, telepresence surgery, complex medical database visualization and rehabilitation (Satava 1998) in one or a couple of their section (tutorial, quiz or test section).

7.3.2 Multi-user's experience

The experiment done in this research is based on one user experience. Meanwhile, a 3D Virtual World as Second Life offers MUVE applications to be used. Therefore, a courseware can be developed by involving many users at the same time. Examples of multi-user experience in health and medical training simulations such as a couple of medical students joined together in performing eye surgery on patients. This multi-user virtual environment (MUVEs) can simulate immersive and collaborative learning environments which could launch lab exercises with real world situations (Clarke 2007). The potential of MUVE in education, particularly in distance education, was recognized early when Second Life has massive growing followers (Gamage 2009. There is a positive attitude towards MUVEs application for teaching and learning where it can be emotionally relative with face-to-face meetings.(Gamage 2009).

Educators believe that conventional techniques of class control would not work in MUVE, therefore, the courseware would be advantageous for implanting MUVE where the students can work with their own time and space provided in a 3D Virtual World (Gamage 2009). Furthermore, studies have proved the instructional power of MUVEs could involve cleaning, compacting and coding MUVEs datasets (Dukas 2009). Finally, multi-user 3D Virtual World courseware may offer a new face for teaching and learning especially in health and medical teaching and training.

7.3.3 Virtual World Courseware for elderly and disabled people

This courseware and its framework design in Virtual World did not consider elderly and disabled people. Thus, there is a room for enhancement towards this matter. Very elderly people and those with an impairment which living outside institutions and dependent on formal services or informal care givers usually used acute hospitals extensively (Melzer 1999). 3D Virtual World courseware can be developed using a simple health module to teach and train online this special group of users. A robotic simulator can also be used to prepare user requirements and user interfaces (Bolmsjo et al 1998) and this can be presented through 3D Virtual World courseware. Training for the visually impaired through Drishti which uses a combination of wearable computers, voice recognition and synthesis, wireless networks, Geographic Information System (GIS) and a Global Positioning System

(GPS) (Hall 2001) may be also be developed using 3D Virtual World courseware. Furthermore, a non-professional visitor which has no previous training (Dijk et al 2003) may use 3D VWC that contain goal-directed information and training. Meanwhile, teleoperation systems utilize ubiquitous connectivity at low cost bandwidth offers sending commands and receive super media feedback which can be applied to medical education (grade 2005). Second Life can be used to entertain people with physical disabilities by using large screens, special joysticks, eye-tracking control and voice (Boulos et al 2007). 3D Virtual environments can be accessible for users who are visually impaired by using haptic and 3D sound for auditory displays (Gareth et al 2008). Thus, 3D Virtual World courseware can be developed using this technique for impaired users in the future.

7.3.4 Non-speech auditory sounds implementation in Virtual World Courseware

This Virtual World Courseware do not stress on non-speech sounds which are believed to be beneficial in enhancing HCI (Human-Computer Interaction) (Brewster 1998). Non-speech sounds can be copied from the surrounding everyday life and used to communicate different objects and actions in computer interfaces (Brewster 1998) which suitable to the information presented (Brewster 1997). An example of a non-speech sound is a pain sound heared when the technique applied is wrong. 3D Virtual World programs and the Second Life library already contain a collection of non-speech sounds but other sounds also can be uploaded. There are also system examples of auditory icons that have been developed and used for avatars such as Sonicfinder(Oakley at al 2000), SharedARK (Brown at al 1989) and

ARKola(Gaver and Smith 1990). The icon can also be used in presenting the non-speech sounds such as when selecting a file, the icon of that file is highlighted and the sound of hitting (selection) wood (file) is played (Brewster 1998). Auditory icons contained non-speech sounds also can be successfully combined with other multimodal metaphors such as speech and earcons (Rigas et al 2000).

7.5 Conclusion and Epilogue

This thesis has investigated the usability aspects of a courseware presentation in an online 3D of Virtual Worlds. The thesis has also explored the effect of the OTQ, OTQT and OTQTV frameworks on users' learning outcomes and perceptions. The results obtained from three experiments within this research program have provided empirical evidence (from statistical results) that OTQ, OTQT and OTQTV frameworks are usable and can be used in developing courseware in the Virtual World. Therefore, we could say that Objective Section, Tutorial Section, Quiz Section, Quiz Section and inclusion of the video presentation in the Tutorial Section could indeed help in improving the usability as well as user's learning performance in online learning performance in online learning interfaces. The statistical results show the experimental findings as well as empirically derived guidelines for the design of more usable online learning applications which contributes to the research literature in both the courseware development and the online learning fields.

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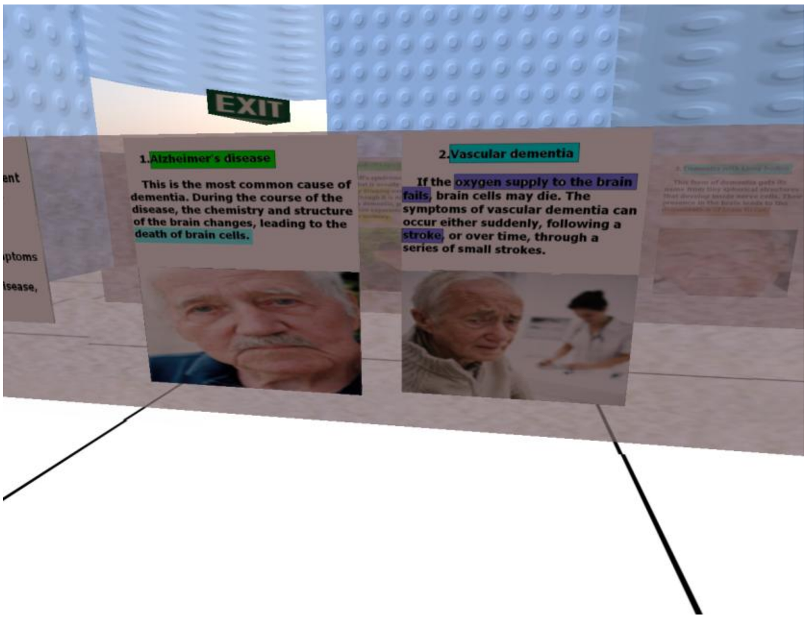
APPENDICES

Appendix A: The Materials Used in the First Experiment

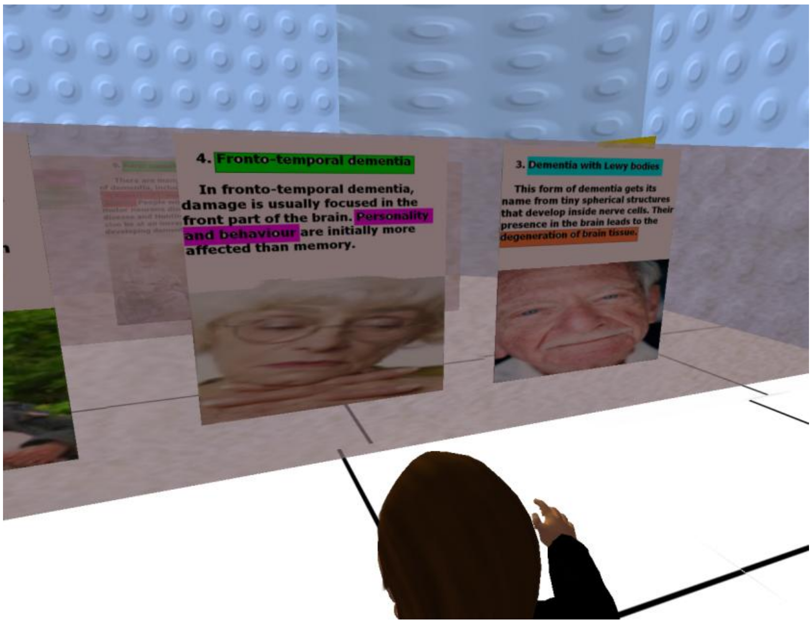
(Appendix A1) The Snapshots of Causes of Dementia Lesson

Appendix A1.1: The snapshot shows the lesson title and objective of Causes of Dementia lesson

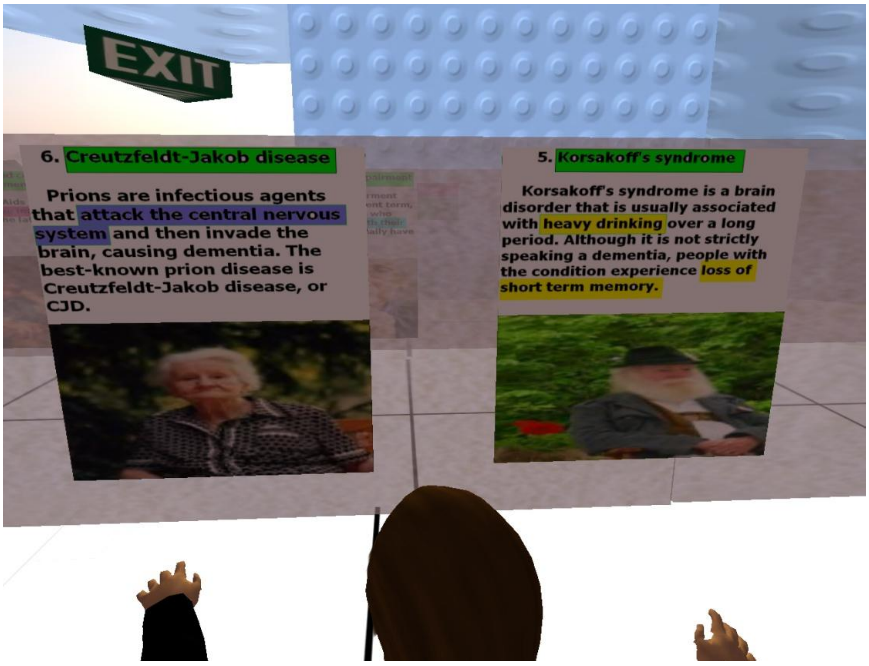
Appendix A1.2: The snapshot shows the room view of Causes of Dementia lesson



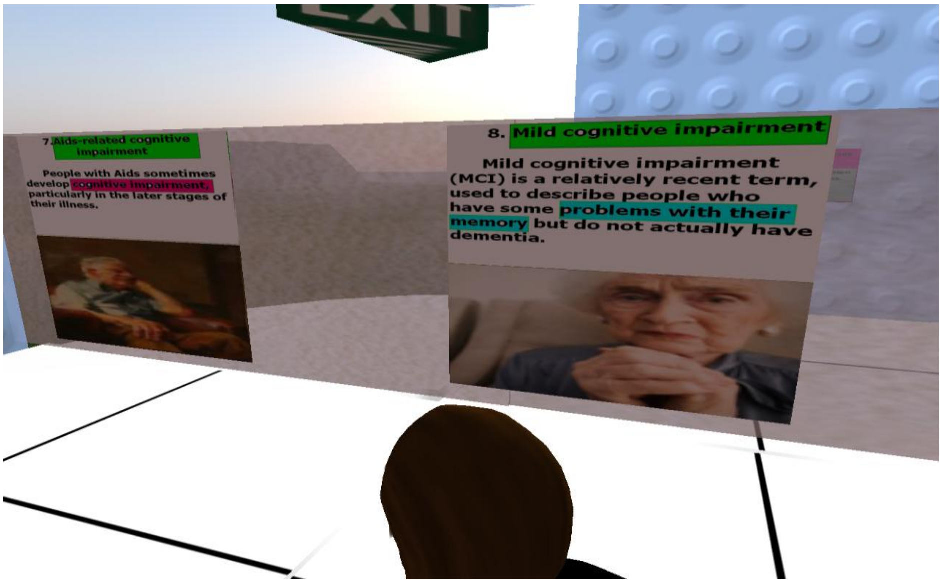
Appendix A1.3: The snapshot shows the first and second points of of Causes of Dementia lesson



Appendix A1.4: The snapshot shows the third and fourth points of of Causes of Dementia lesson



Appendix A1.5: The snapshot shows the sixth and seventh points of of Causes of Dementia lesson

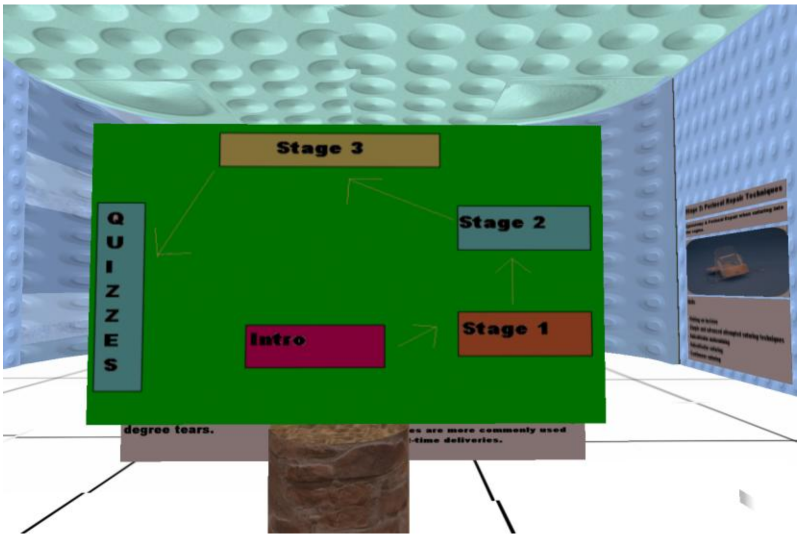


Appendix A1.6: The snapshot shows the seventh and eighth points of of Causes of Dementia lesson

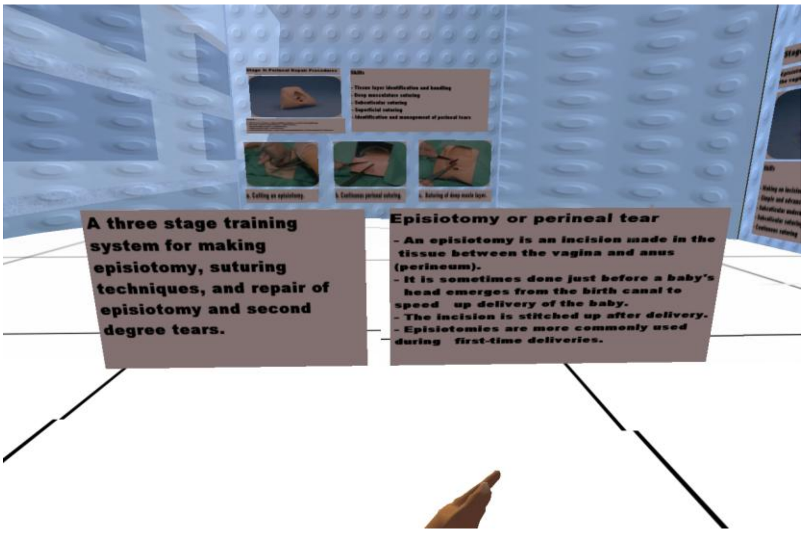
Appendix A1.7: The snapshot shows the ninth point of of Causes of Dementia lesson

(Appendix A2) The Snapshots of Episiotomy Lesson

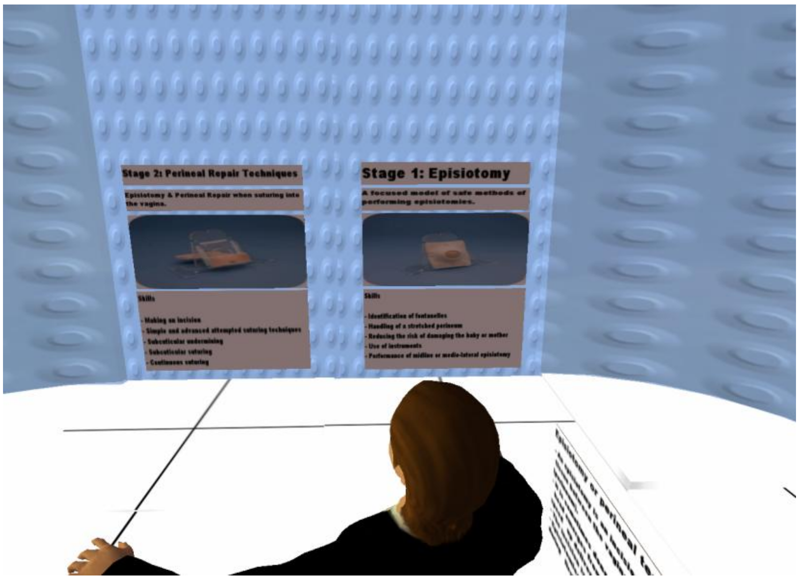
Appendix A2.1: The snapshot shows the 3D building of the episiotomy lesson



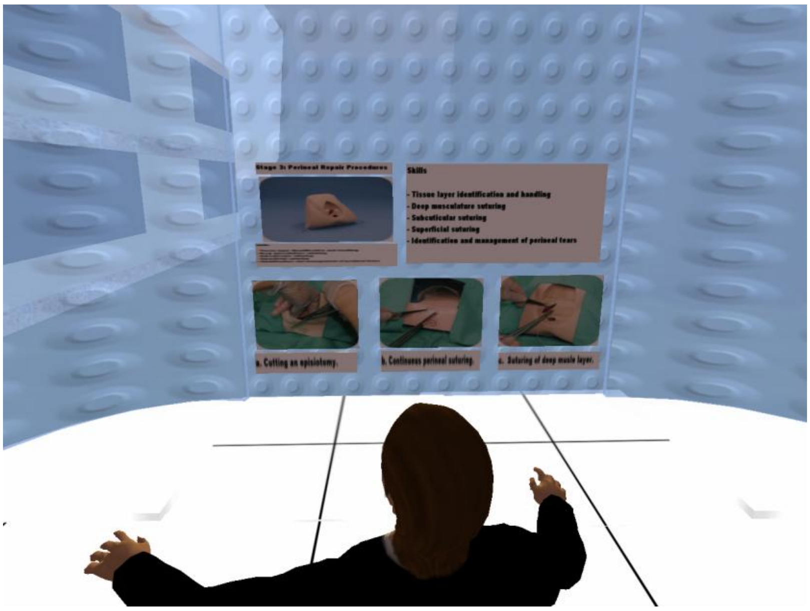
Appendix A2.2: The snapshot shows the map used in the episiotomy lesson



Appendix A2.3: The snapshot shows the objective of the episiotomy lesson



Appendix A2.4: The snapshot shows the fisrt and second tutorial lesson of the episiotomy



Appendix A2.5: The snapshot shows the third tutorial lesson of the episiotomy

(Appendix A3) Episiotomy lesson

There are three stages system for making an episiotomy, suturing techniques and repair of episiotomy and second degree tear:

<u>Episiotomy and perineal tear</u> - An episiotomy is an incision made in the tissue between the vagina and anus (perineum). It is sometimes done when before a baby's head emerges from the birth canal to speed the delivery of the baby. The incision is stitched up after delivery. Episiotomies are more commonly used during first-time deliveries. The three stages of episiotomies are

1) A focused model of safe methods of performing episiotomies. Skill required, are:

- Identification of fontanel
- Handling of stretched perineum
- Redusing the risk of damaging the baby or mother
- Use of instruments
- Performance of midlines or media-lateral of episiotomy

2) Episiotomy and perineal repair when suturing into vagina. Skills required, are:

- Making an incision
- Sinmple and advanced attempted suturing techniques
- Subcuticular undermining
- Subcuticular suturing
- Continuous suturing

(Appendix A4) Causes of Dementia lesson

This module is about the causes of dementia. There are 9 common causes of dementia. They are:

1) Alzheimer's disease- This is the most common cause of dementia. During the course of the disease, the chemistry and structure of the brain changes, leading to the death of brain cells.

2) Vascular dementia - If the oxygen supply to the brain fails, brain cells may die. The symptoms of vascular dementia can occur either suddenly, following a stroke, or over time, through a series of small strokes.

3) Dementia with Lewy bodies - This form of dementia gets its name from tiny spherical structures that develop inside nerve cells. Their presence in the brain leads to the degeneration of brain tissue.

4) Fronto-temporal dementia - In fronto-temporal dementia, damage is usually focused in the front part of the brain. Personality and behaviour are initially more affected than memory.

5) Korsakoff's syndrome - Korsakoff's syndrome is a brain disorder that is usually associated with heavy drinking over a long period. Although it is not strictly speaking a dementia, people with the condition experience loss of short term memory.

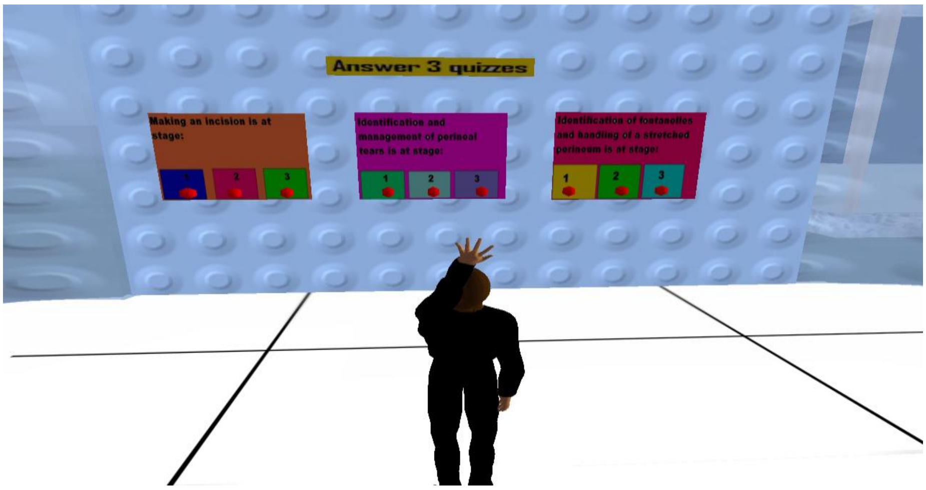
6) Creutzfeldt-Jakob disease - Prions are infectious agents that attack the central nervous system and then invade the brain, causing dementia. The best-known prion disease is Creutzfeldt-Jakob disease, or CJD.

7) Aids-related cognitive impairment - People with Aids sometimes develop cognitive impairment, particularly in the later stages of their illness.

8) Mild cognitive impairment - Mild cognitive impairment (MCI) is a relatively recent term, used to describe people who have some problems with their memory but do not actually have dementia.

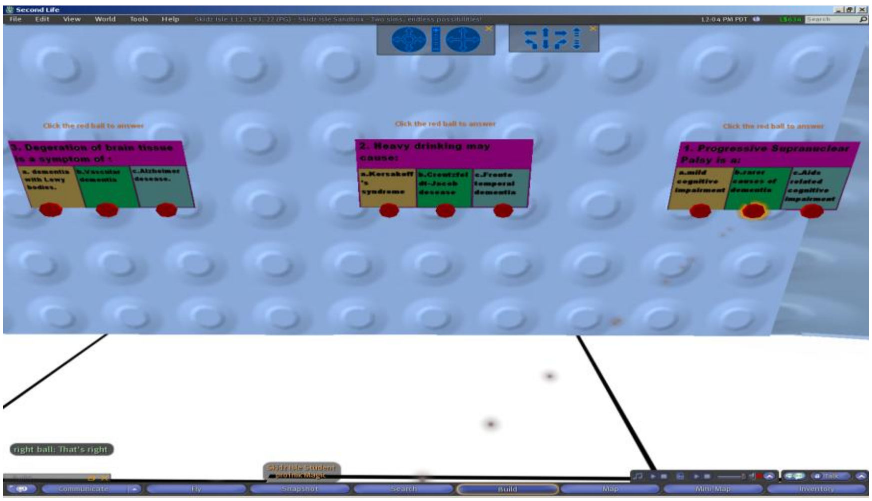
9) Rarer causes of dementia - There are many other rarer causes of dementia, including progressive supranuclear palsy and Binswanger's disease. People with multiple sclerosis, motor neurone disease, Parkinson's disease and Huntington's disease can also be at an increased risk of developing dementia.

(Appendix A5) The Quiz Question Used in the Episiotomy Lesson



Appendix A5.1: The snapshot shows the quiz section of the Episiotomy lesson

(Appendix A6) The Quiz Question Used in the Causes of Dementia Lesson



Appendix A6.1: The snapshot shows the quiz section of the Causes of Dementia lesson

(Appendix A7) The Questionnaire Used in the First Experiment

Gender: male/female

Course:_________

Year: 1/2/3/4

Lesson: episiotomy/ dementia

1. Is the objective given at the beginning of the learning session, explain the goal of the learning?

2. Do you understand the explanation inside the tutorial given?

3. Is the tutorial given increase your knowledge compared to other reading lesson inside the class?

4. Does the 3D animation given; helps you learn about the complex subject which hard to understand through the reading material?

5. Do you feel bored during the learning session?

6. Do you think learning this type of program is hard?

7. Do you think this type of learning wasting your time?

8. Do you think, you need a longer training time about the program before do the learning session?

9. Does the movement in the program and the speed of the learning fast enough?

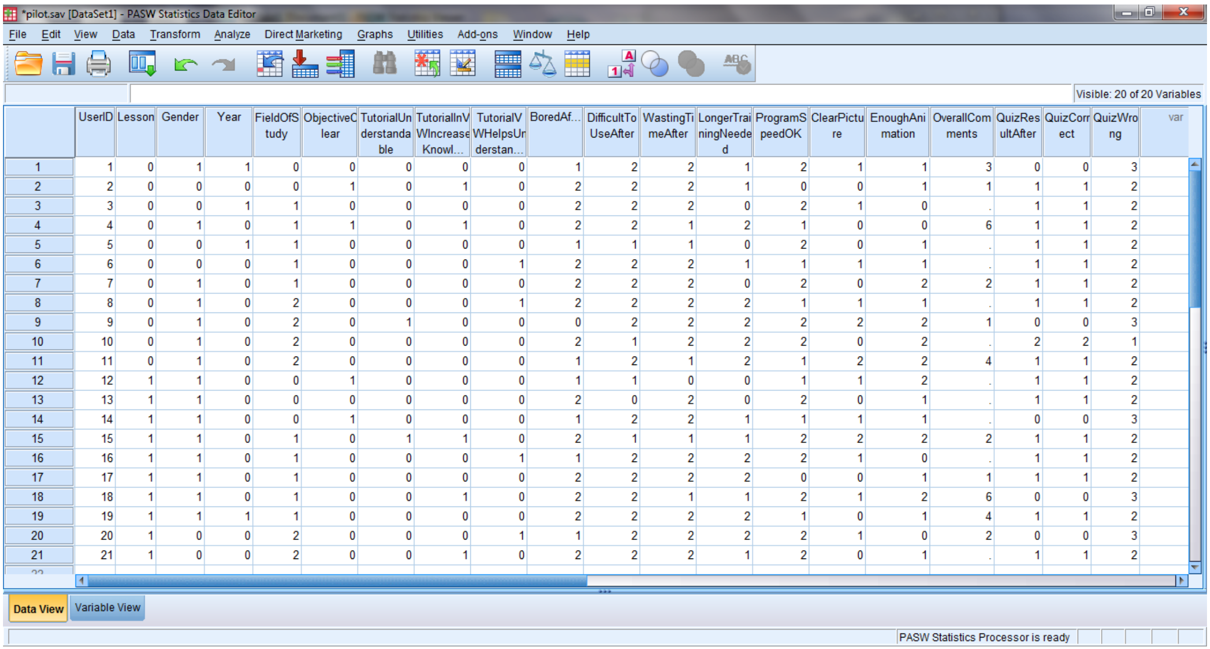
10. Is the pictures given clear?

11. Is the animation given enough for the learning session?

Comments and suggestions:
…….

………

(Appendix A8) The Raw Data of the First Experiment



*pilot.sav [DataSet1] - PASW Statistics Data Editor

File Edit View Data Transform Analyze Direct Marketing Graphs Utilities Add-ons Window Help

Visible: 20 of 20 Variables

	UserID	Lesson	Gender	Year	FieldOfStudy	ObjectiveClear	TutorialUnderstandable	TutorialInVWIncreaseKnowl...	TutorialVWHelpsUnderstan...	BoredAf...	DifficultToUseAfter	WastingTimeAfter	LongerTrainingNeeded	ProgramSpeedOK	ClearPicture	EnoughAnimation	OverallComments	QuizResultAfter	QuizCorrect	QuizWrong	var
1	1	0	1	1	0	0	0	0	0	1	2	2	1	2	1	1	3	0	0	3	
2	2	0	0	0	0	1	0	1	0	2	2	2	1	0	0	1	1	1	1	2	
3	3	0	0	1	1	0	0	0	0	2	2	2	0	2	1	0	.	1	1	2	
4	4	0	1	0	1	1	0	1	0	2	2	1	2	1	0	0	6	1	1	2	
5	5	0	0	1	1	0	0	0	0	1	1	1	0	2	0	1	.	1	1	2	
6	6	0	0	0	1	0	0	0	1	2	2	2	1	1	1	1	.	1	1	2	
7	7	0	1	0	1	0	0	0	0	2	2	2	0	2	0	2	2	1	1	2	
8	8	0	1	0	2	0	0	0	1	2	2	2	2	1	1	1	.	1	1	2	
9	9	0	1	0	2	0	1	0	0	0	2	2	2	2	2	2	1	0	0	3	
10	10	0	1	0	2	0	0	0	0	2	1	2	2	2	0	2	.	2	2	1	
11	11	0	1	0	2	0	0	0	0	1	2	1	2	1	2	2	4	1	1	2	
12	12	1	1	0	0	1	0	0	0	1	1	0	0	1	1	2	.	1	1	2	
13	13	1	1	0	0	0	0	0	0	2	0	2	0	2	0	1	.	1	1	2	
14	14	1	1	0	0	1	0	0	0	1	2	2	1	1	1	1	.	0	0	3	
15	15	1	1	0	1	0	1	1	0	2	1	1	1	2	2	2	2	1	1	2	
16	16	1	1	0	1	0	0	0	1	1	2	2	2	2	1	0	.	1	1	2	
17	17	1	1	0	1	0	0	0	0	2	2	2	2	0	0	1	1	1	1	2	
18	18	1	1	0	1	0	0	1	0	2	2	1	1	2	1	2	6	0	0	3	
19	19	1	1	1	1	0	0	0	0	2	2	2	2	1	0	1	4	1	1	2	
20	20	1	0	0	2	0	0	0	1	1	2	2	2	2	1	0	2	0	0	3	
21	21	1	0	0	2	0	0	1	0	2	2	2	1	2	0	1	.	1	1	2	

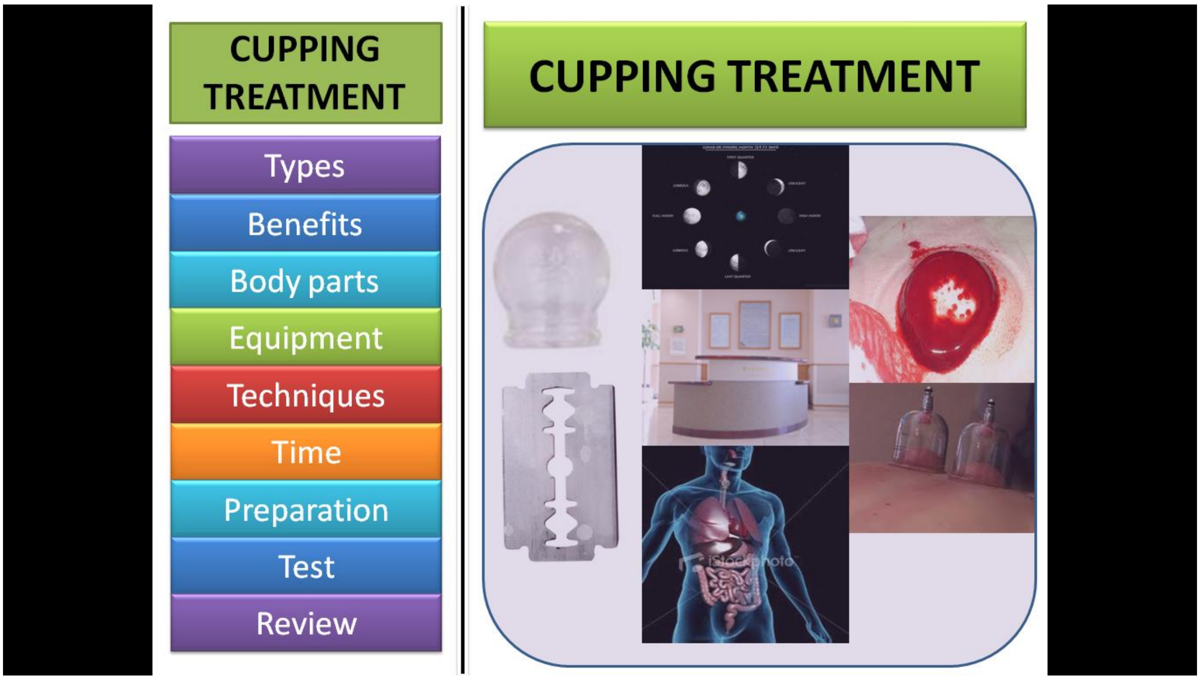
Data View | Variable View

PASW Statistics Processor is ready

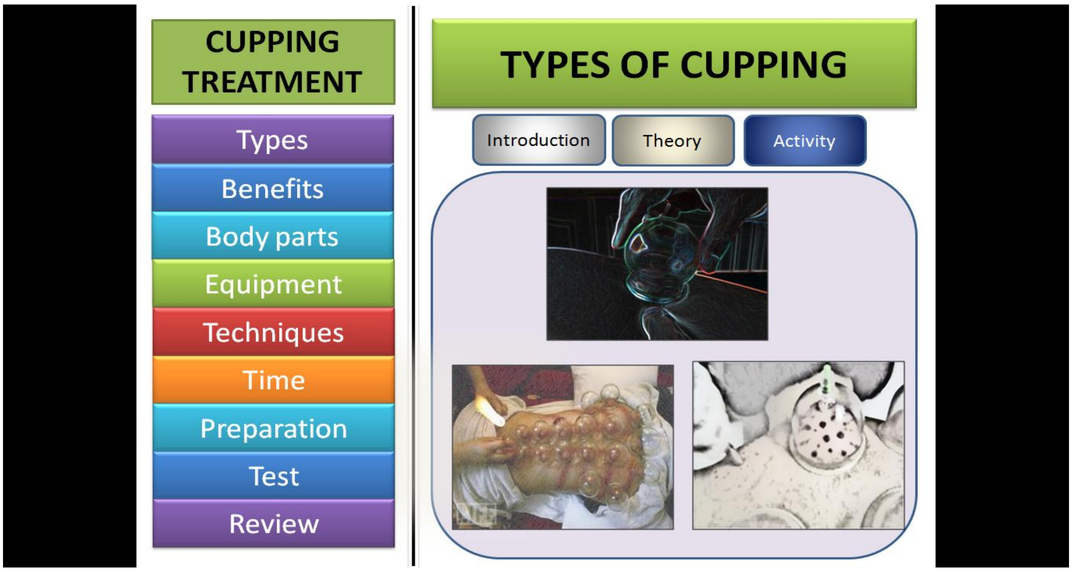
Appendix A8.1: The snapshot shows the raw data used in the first experiment

Appendices B: The Materials Used in the Second Experiment

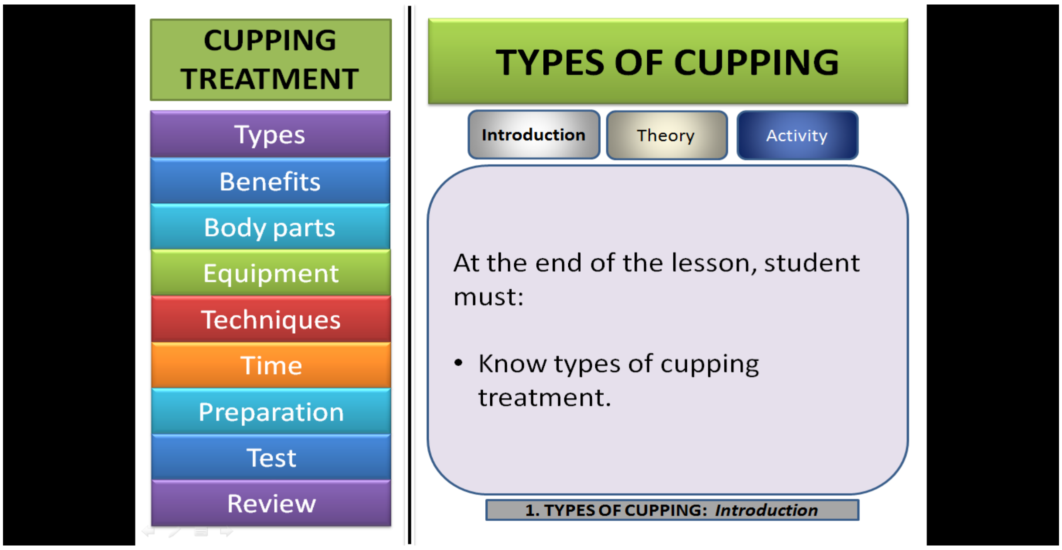
(Appendix B1) The Snapshots of 2DC



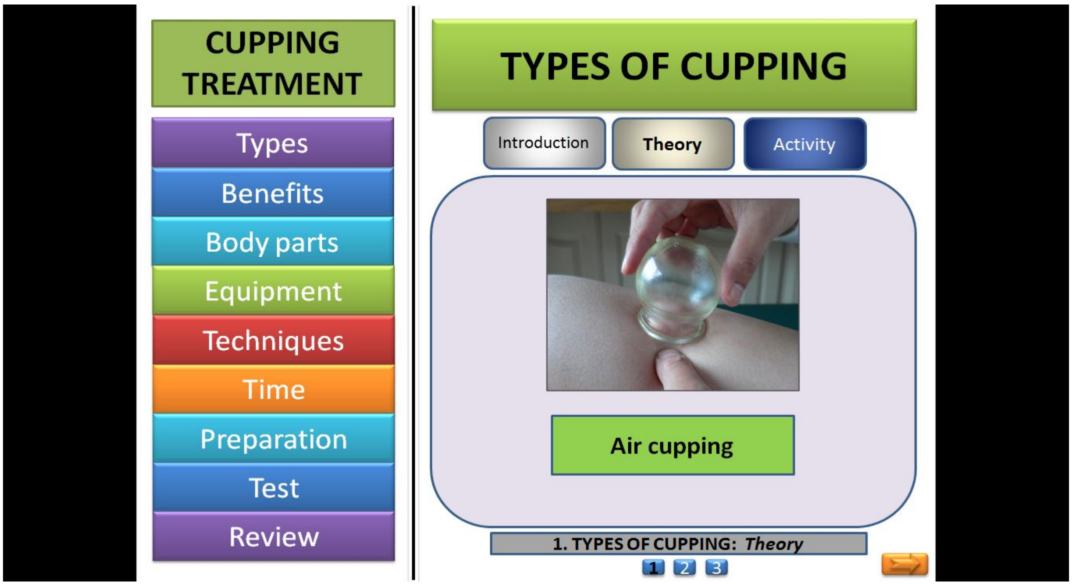
Appendix B1.1: The snapshot shows the front page of 2DC



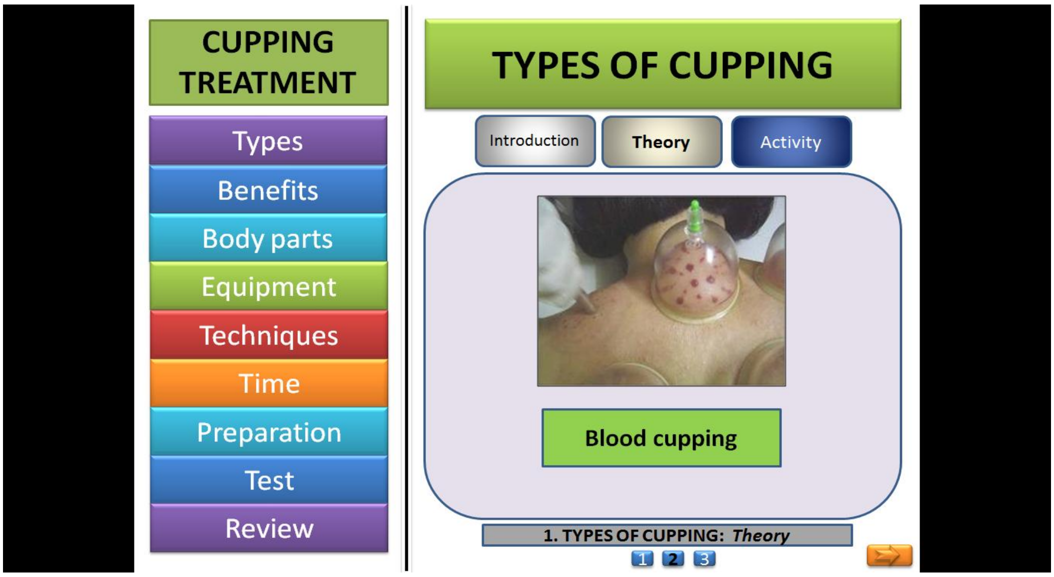
Appendix B1.2: The snapshot shows the front page of the first lesson in 2DC



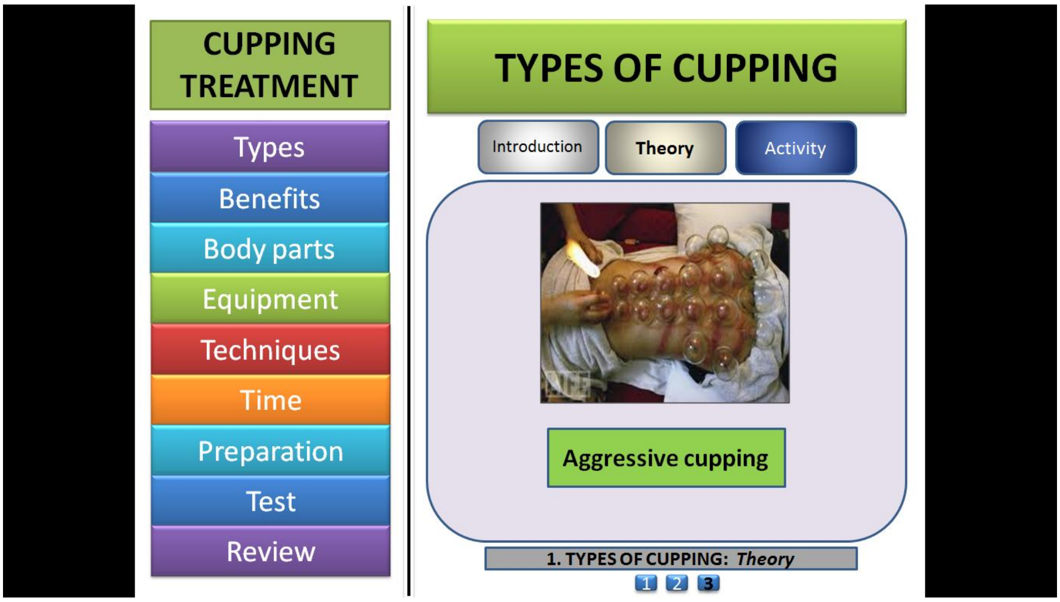
Appendix B1.3: The snapshot shows the objective page of the first lesson in 2DC



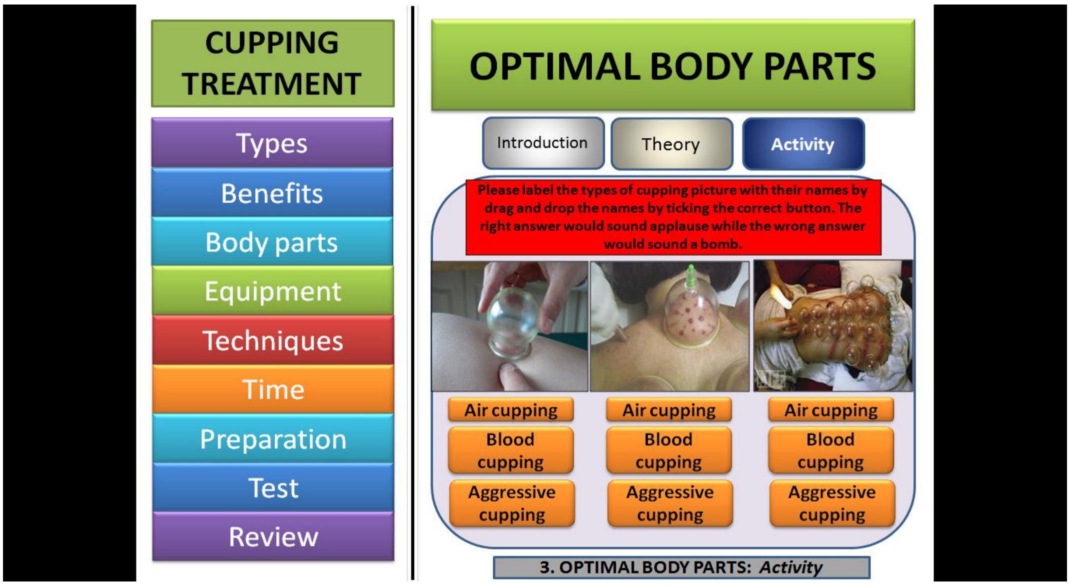
Appendix B1.4: The snapshot shows the first page of the first lesson tutorial in 2DC



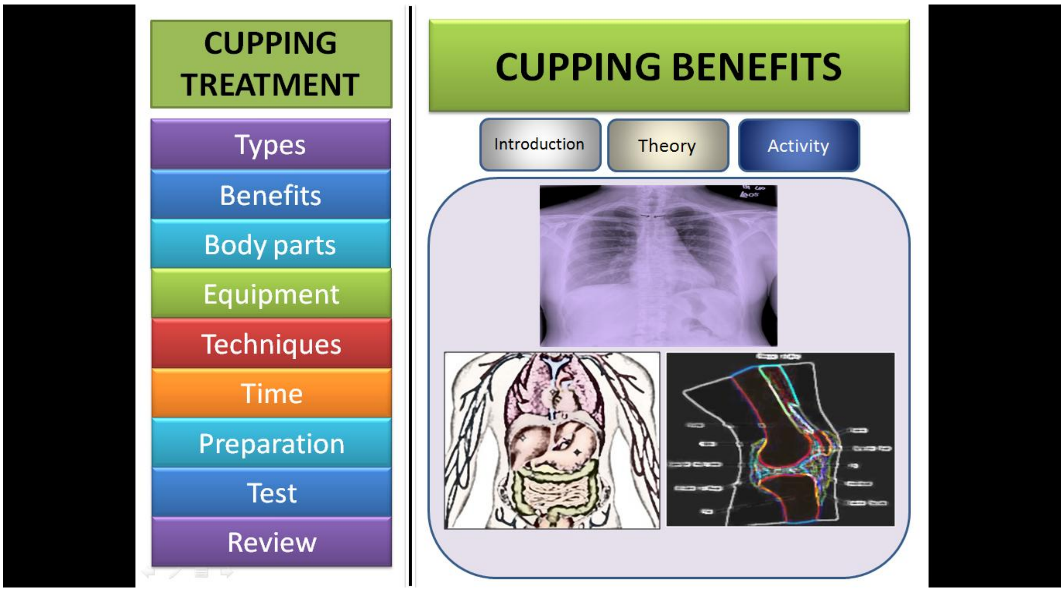
Appendix B1.5: The snapshot shows the second page of the first lesson tutorial in 2DC



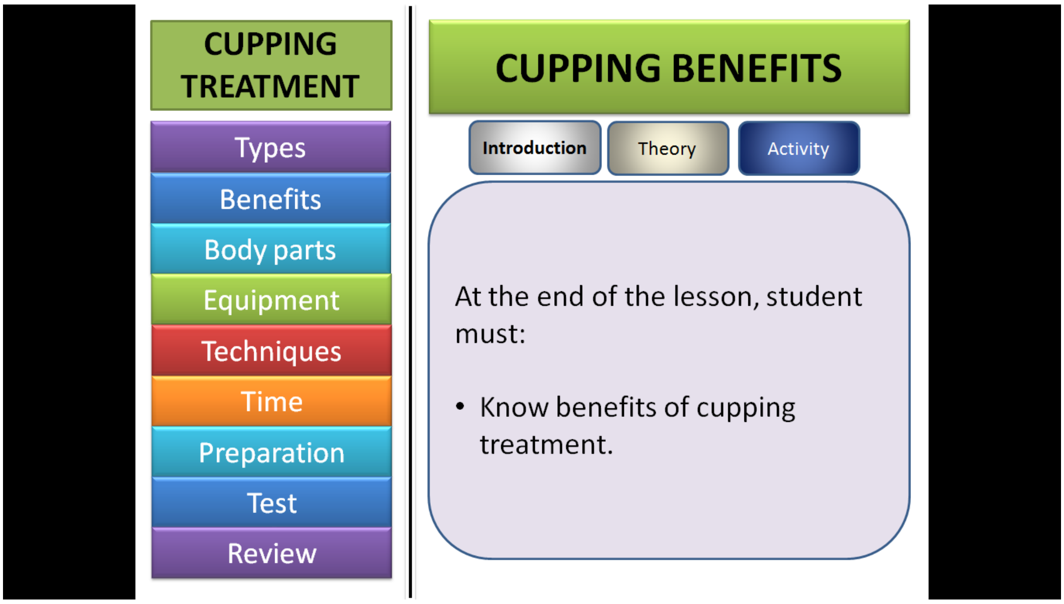
Appendix B1.6: The snapshot shows the third page of the first lesson tutorial in 2DC



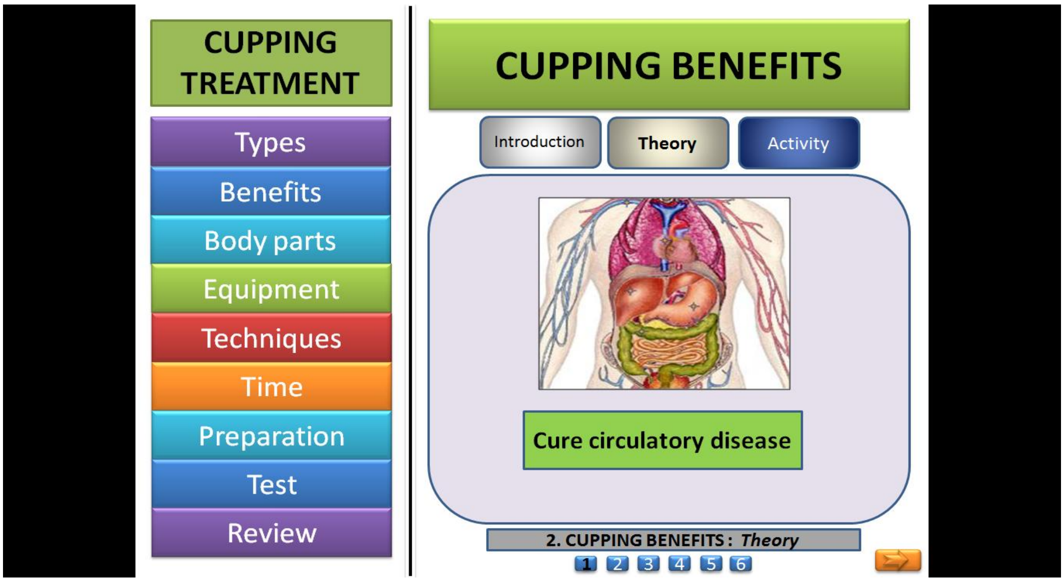
Appendix B1.7: The snapshot shows the quiz page of the first lesson tutorial in 2DC



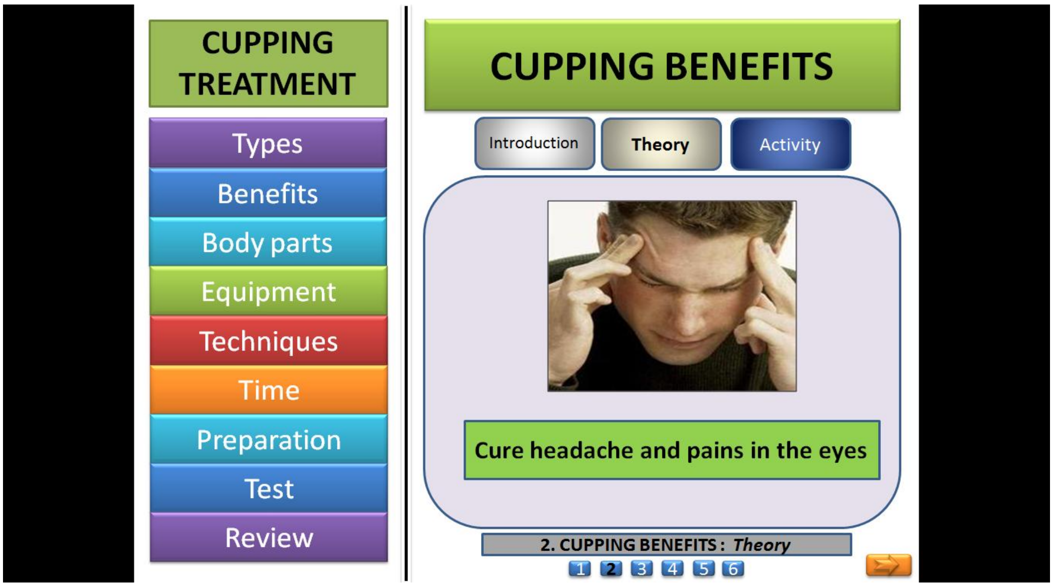
Appendix B1.8: The snapshot shows the front page of the second lesson in 2DC



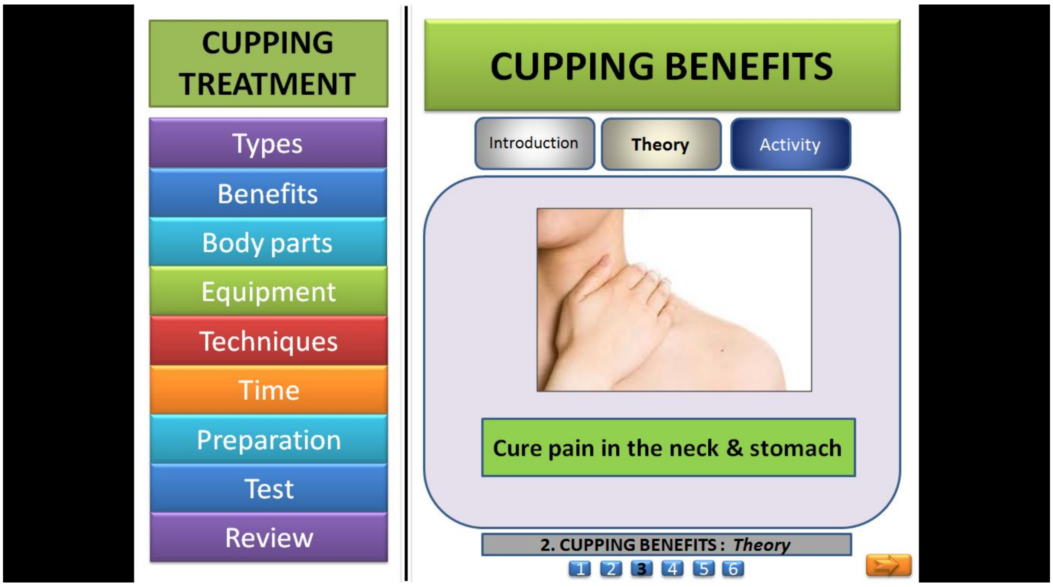
Appendix B1.9: The snapshot shows the objective page of the second lesson in 2DC



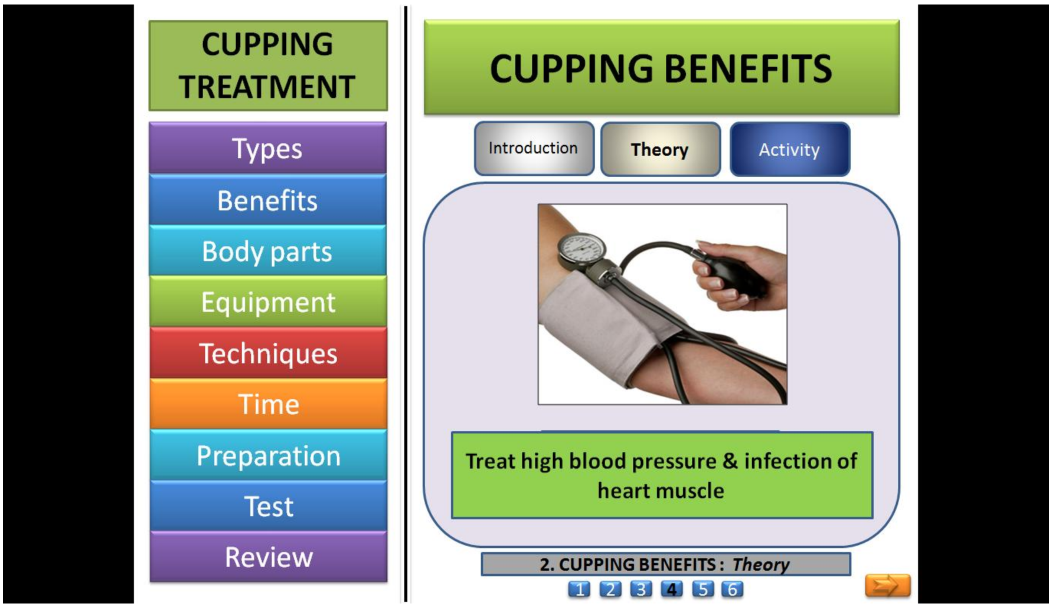
Appendix B1.10: The snapshot shows the first page of the second lesson tutorial in 2DC



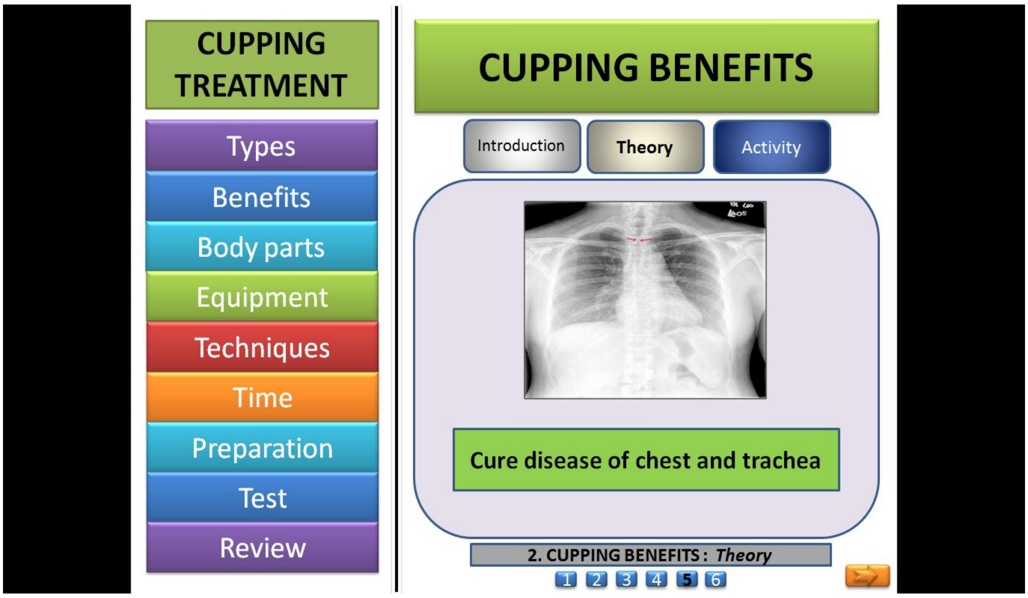
Appendix B1.11: The snapshot shows the second page of the second lesson tutorial in 2DC



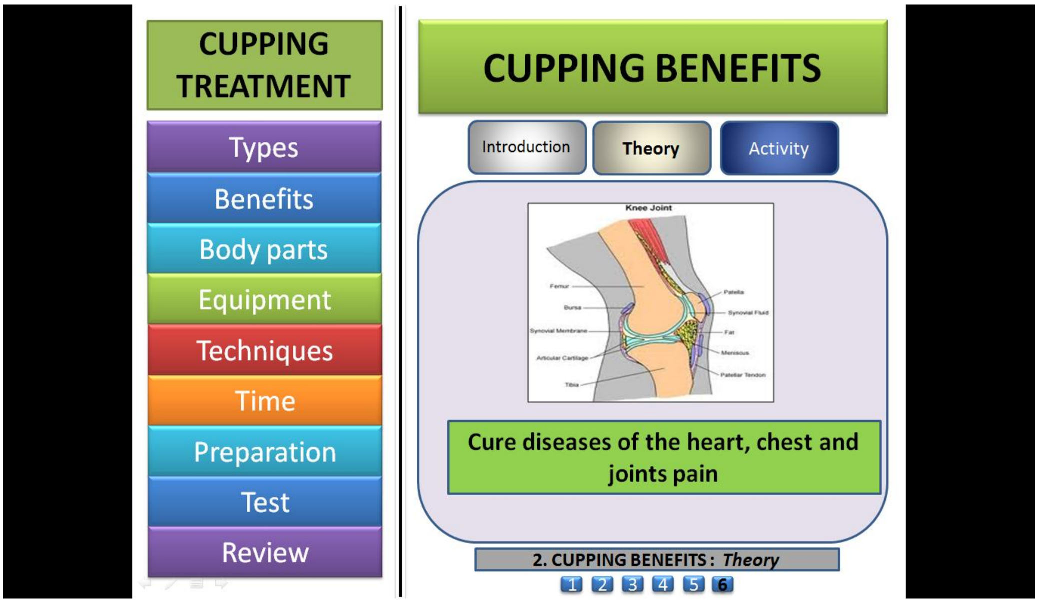
Appendix B1.12: The snapshot shows the third page of the second lesson tutorial in 2DC



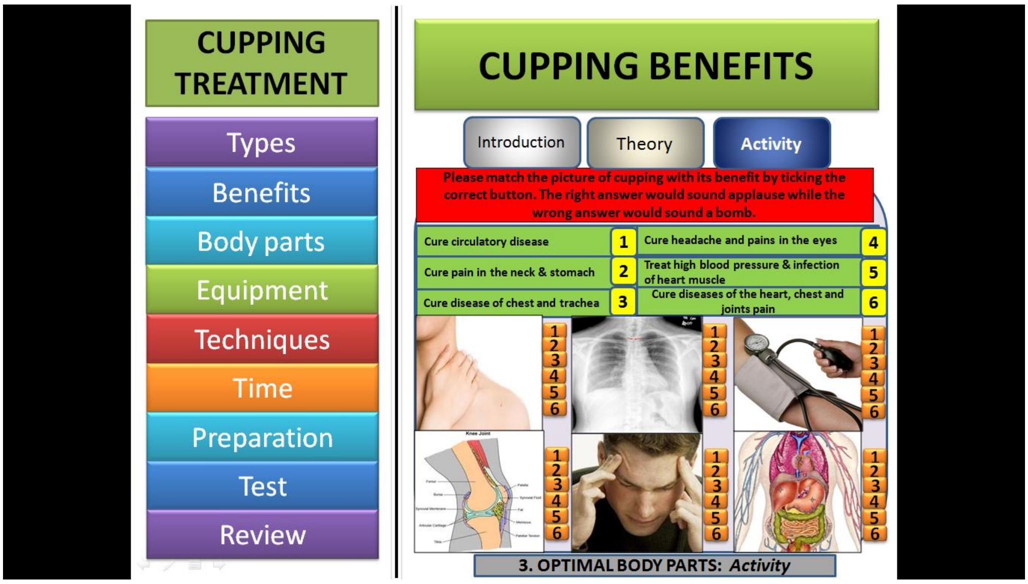
Appendix B1.13: The snapshot shows the fourth page of the second lesson tutorial in 2DC



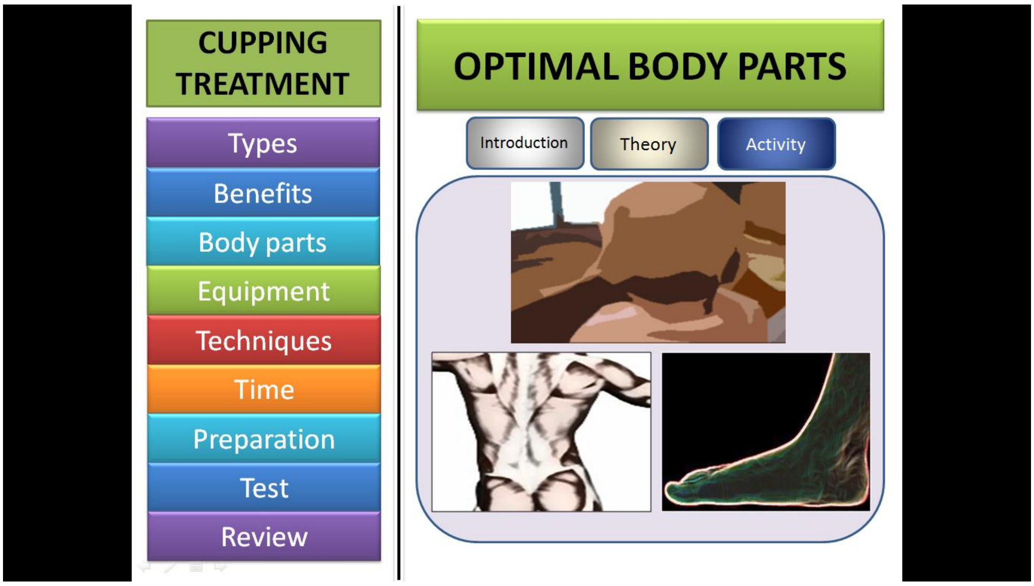
Appendix B1.14: The snapshot shows the fifth page of the second lesson tutorial in 2DC



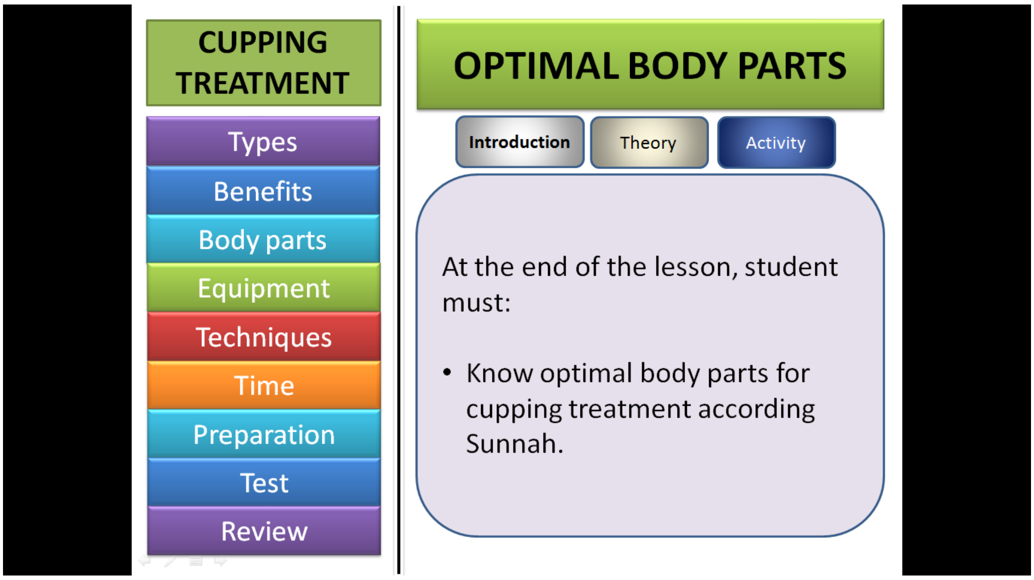
Appendix B1.15: The snapshot shows the sixth page of the second lesson tutorial in 2DC



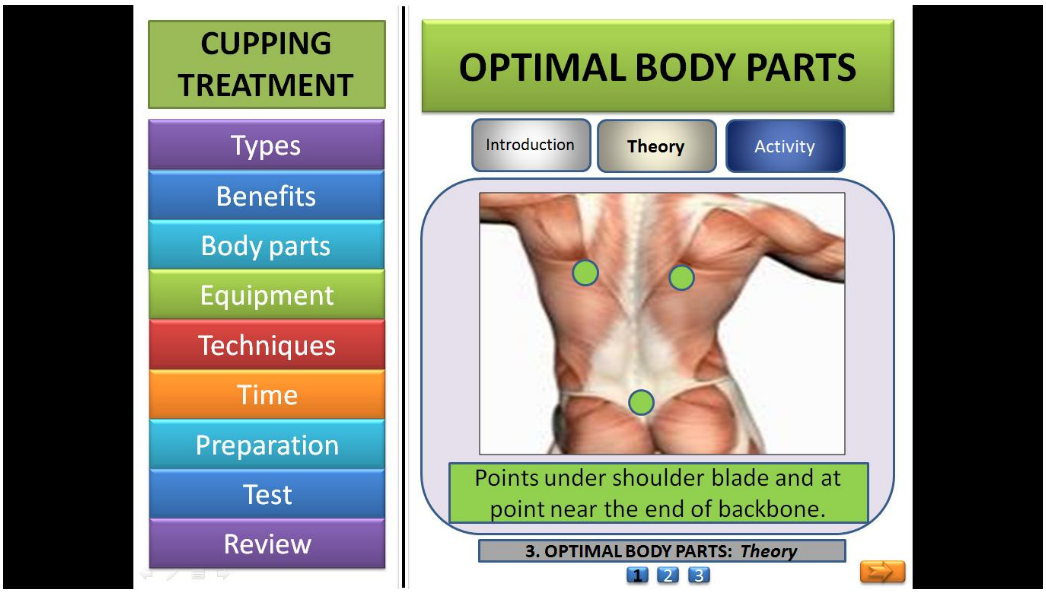
Appendix B1.16: The snapshot shows the quiz page of the second lesson tutorial in 2DC



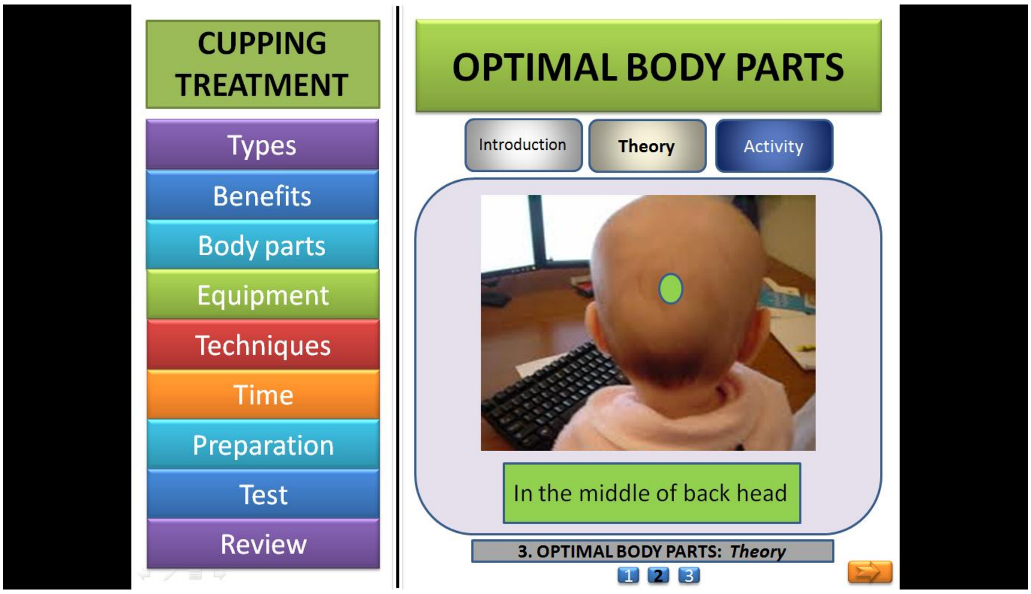
Appendix B1.17: The snapshot shows the front page of the third lesson in 2DC



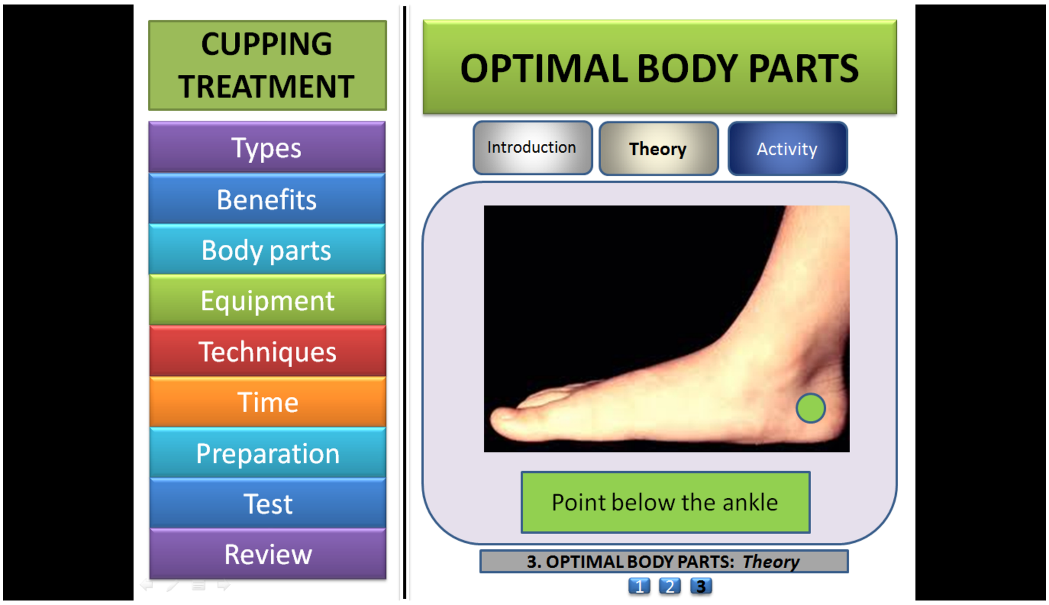
Appendix B1.18: The snapshot shows the objective page of the third lesson in 2DC



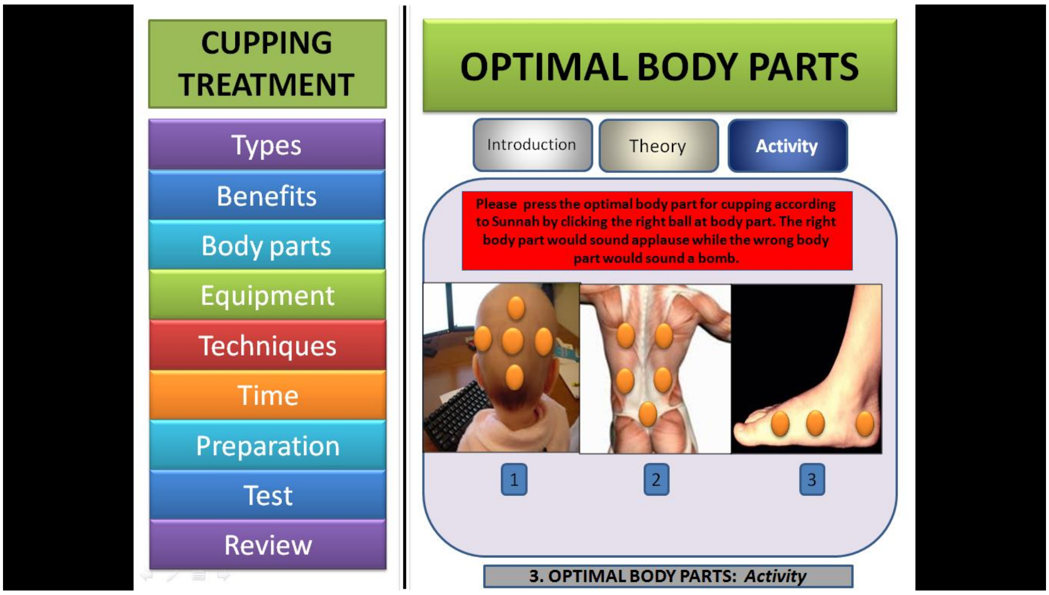
Appendix B1.19: The snapshot shows the first page of the third lesson tutorial in 2DC



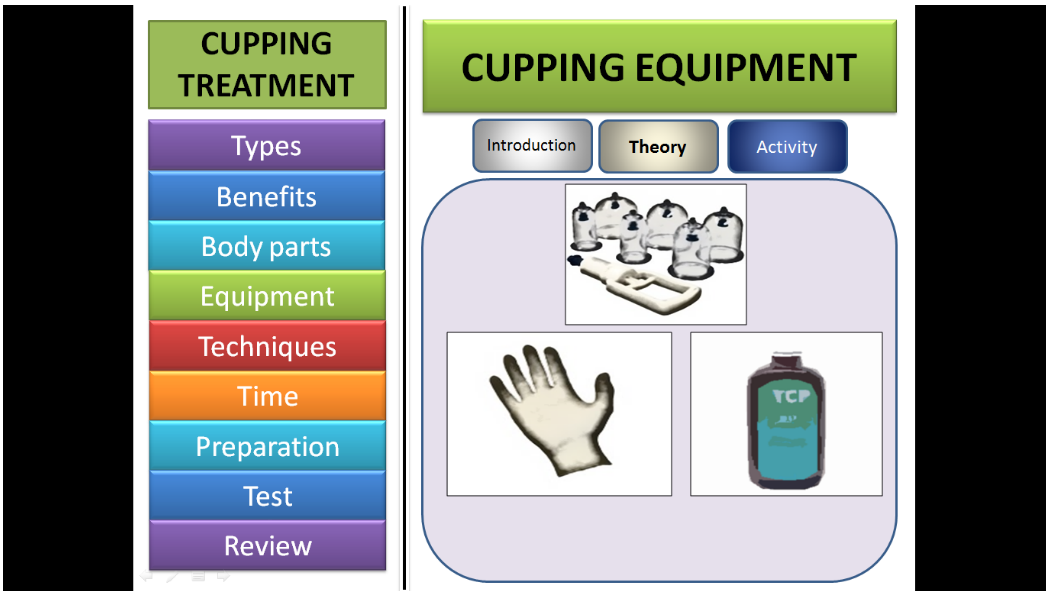
Appendix B1.20: The snapshot shows the second page of the third lesson tutorial in 2DC



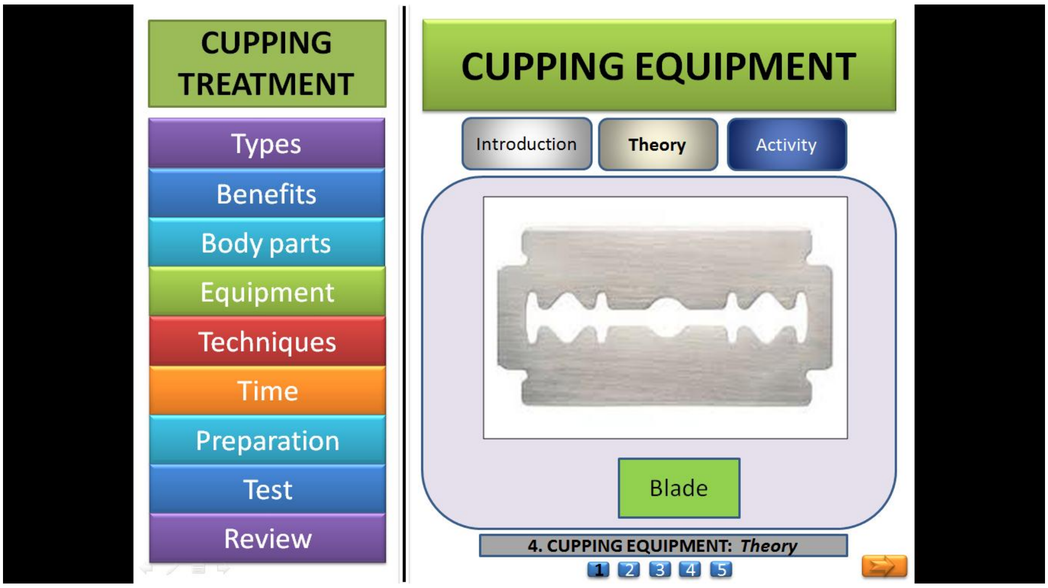
Appendix B1.21: The snapshot shows the third page of the third lesson tutorial in 2DC



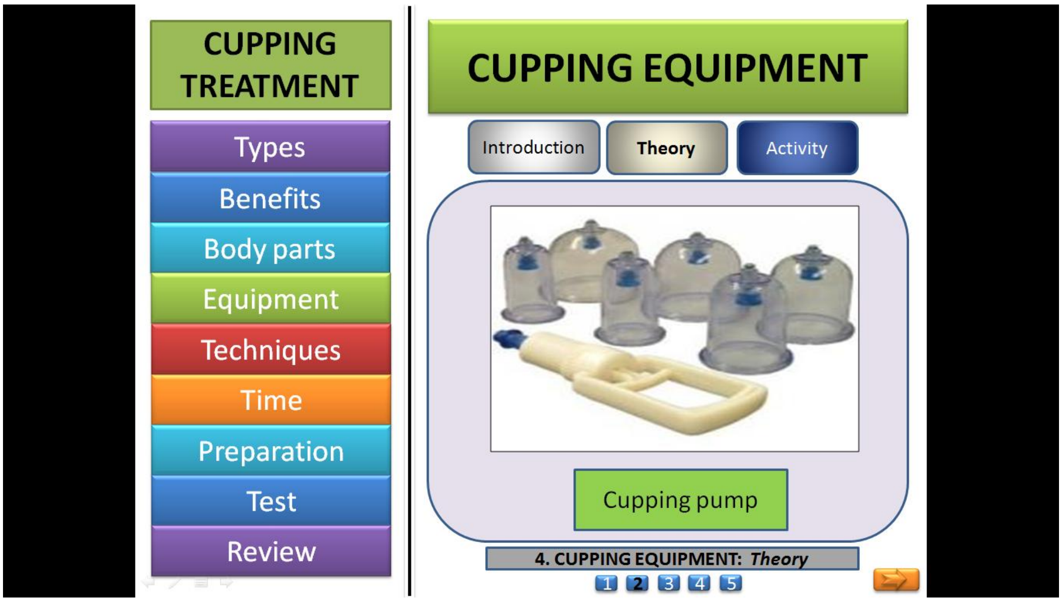
Appendix B1.22: The snapshot shows the quiz page of the third lesson tutorial in 2DC



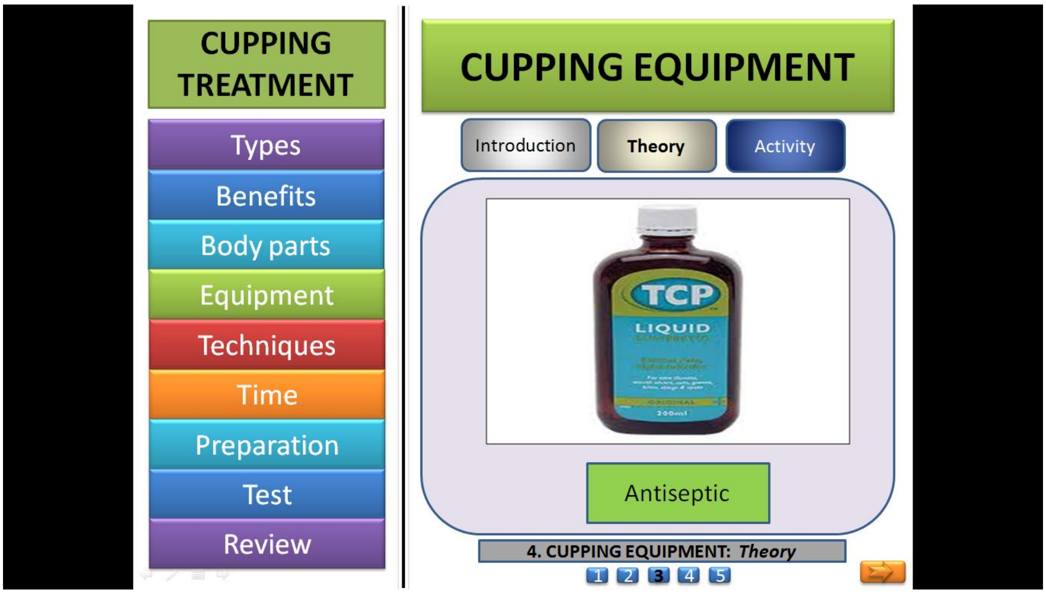
Appendix B1.23: The snapshot shows the front page of the fourth lesson in 2DC



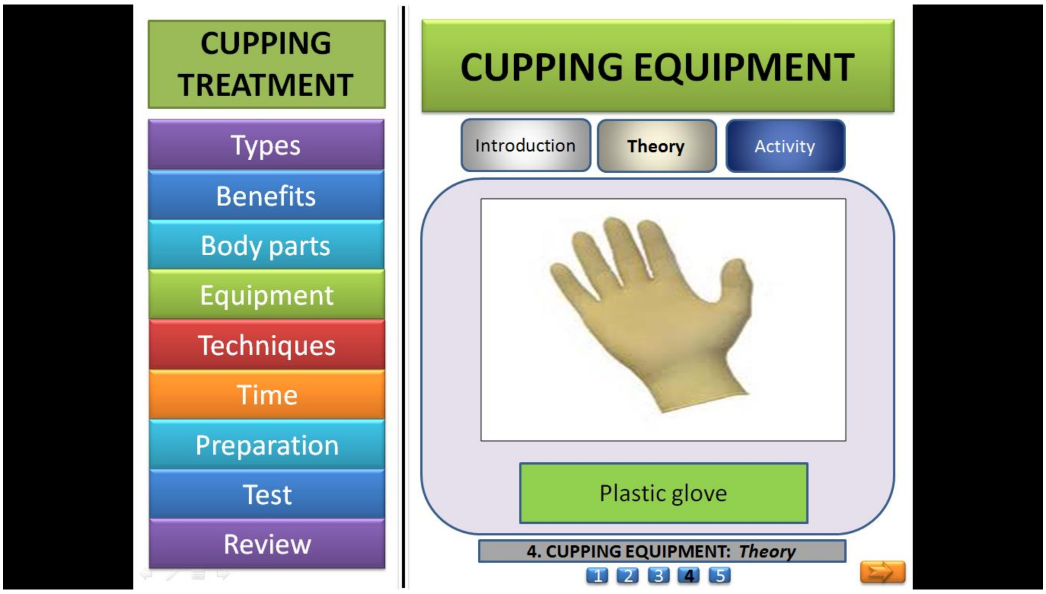
Appendix B1.24: The snapshot shows the first page of the fourth lesson tutorial in 2DC



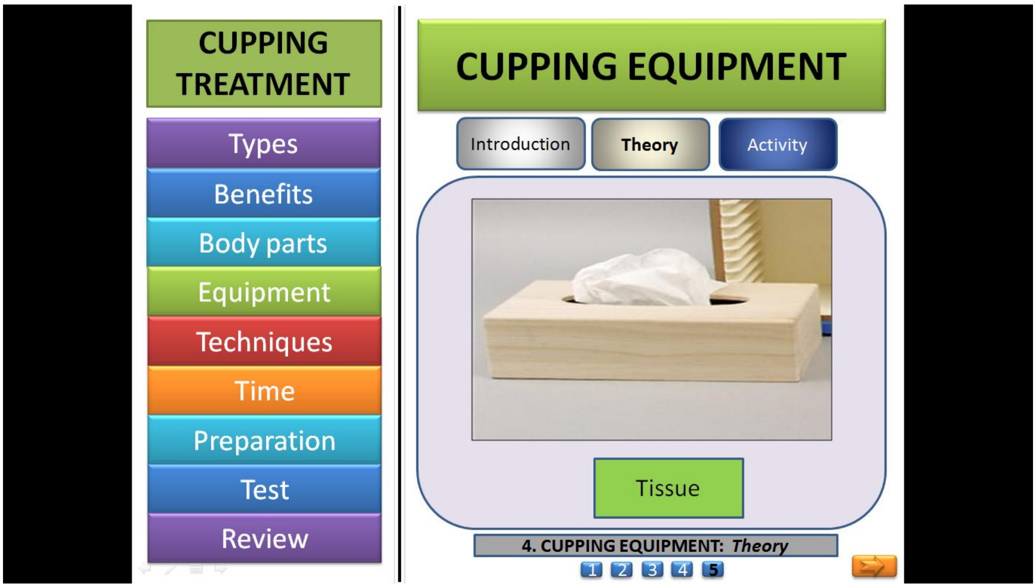
Appendix B1.25: The snapshot shows the second page of the fourth lesson tutorial in 2DC



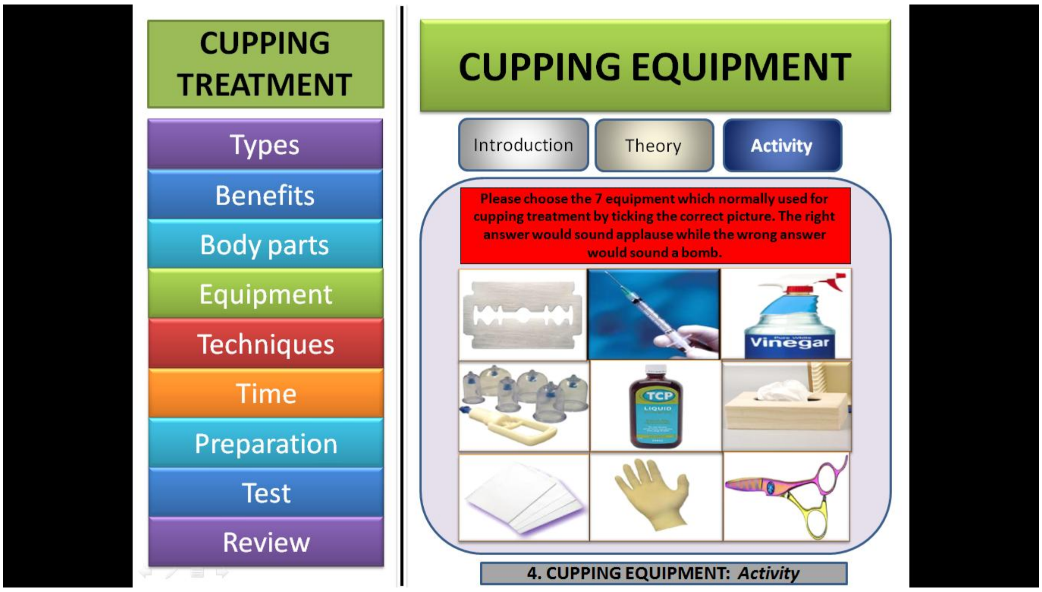
Appendix B1.26: The snapshot shows the third page of the fourth lesson tutorial in 2DC



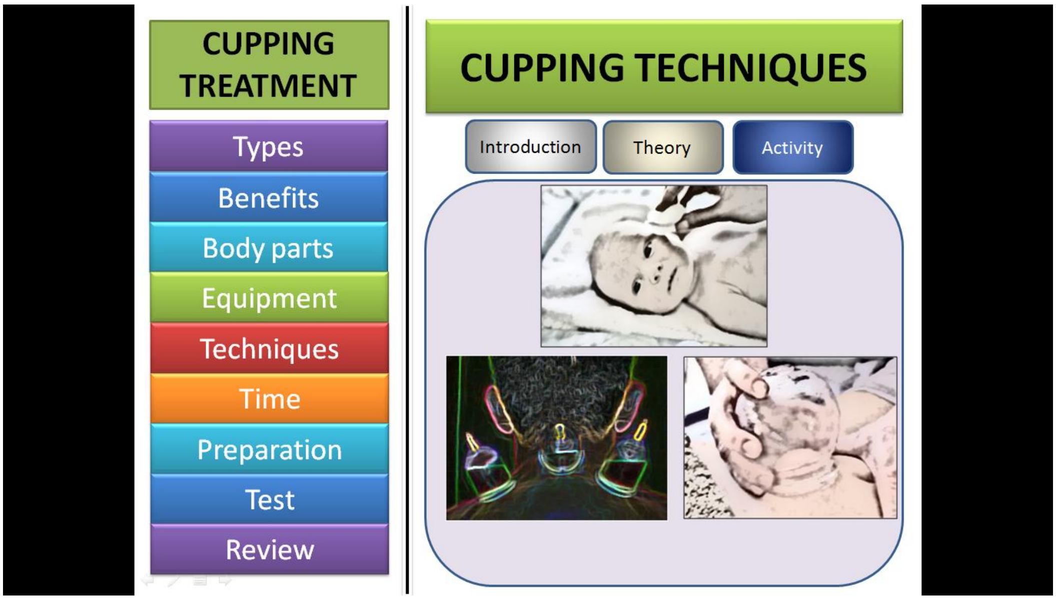
Appendix B1.27: The snapshot shows the fourth page of the fourth lesson tutorial in 2DC



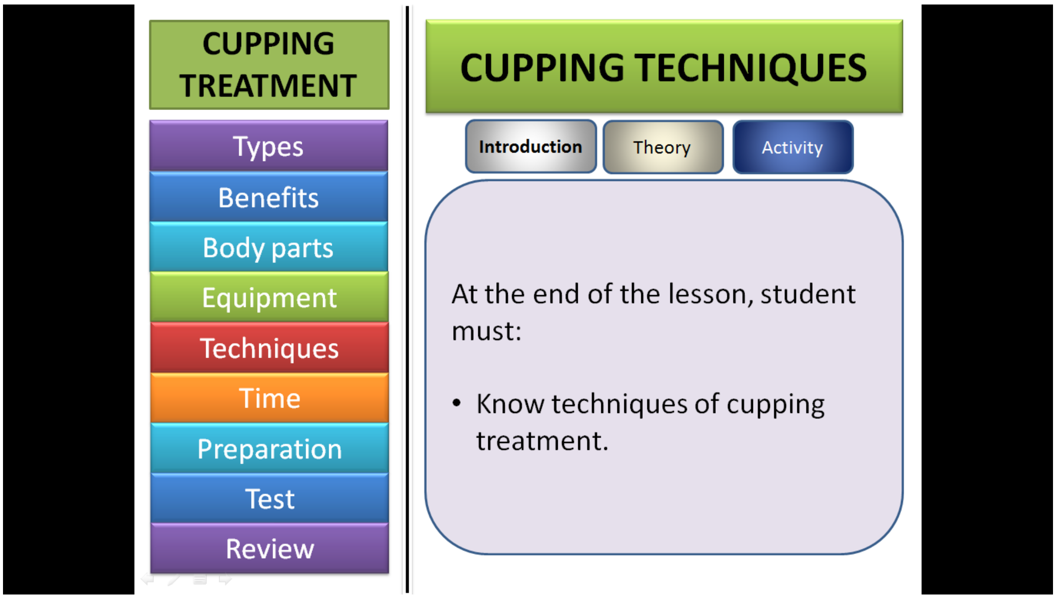
Appendix B1.28: The snapshot shows the fifth page of the fourth lesson tutorial in 2DC



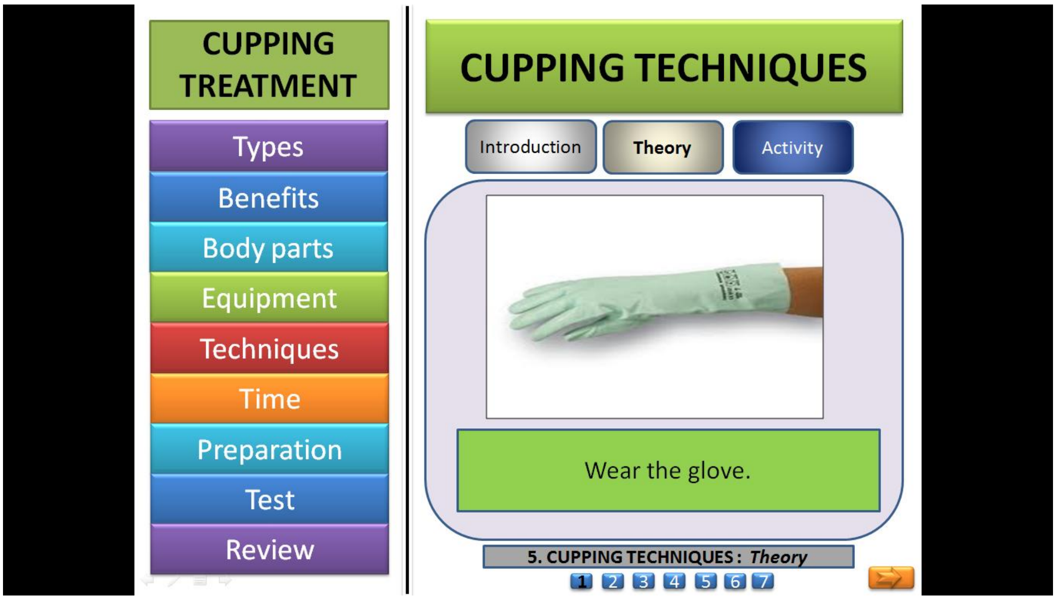
Appendix B1.29: The snapshot shows the quiz page of the fourth lesson tutorial in 2DC



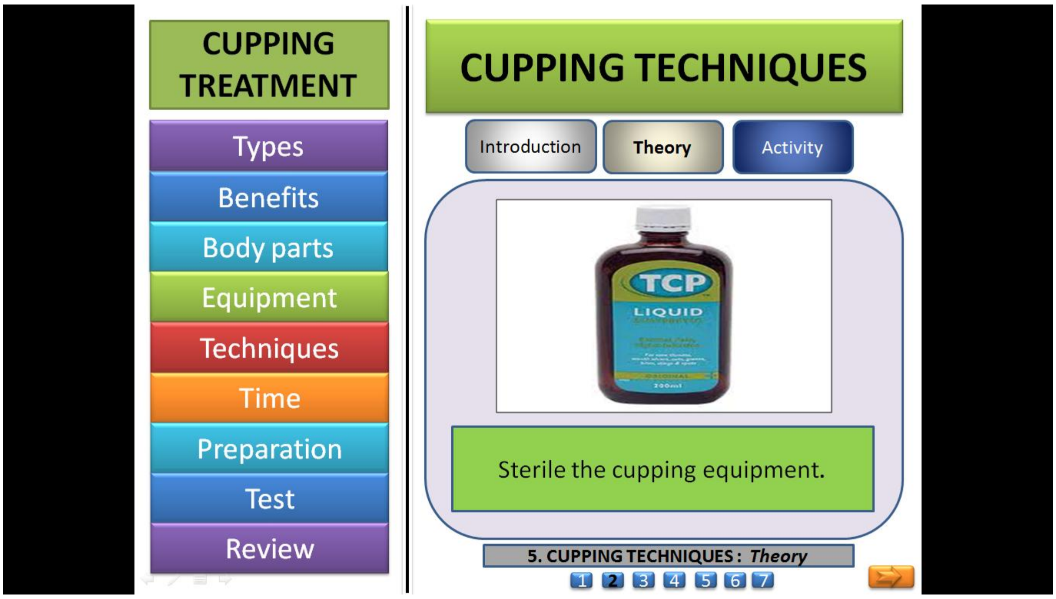
Appendix B1.30: The snapshot shows the front page of the fifth lesson in 2DC



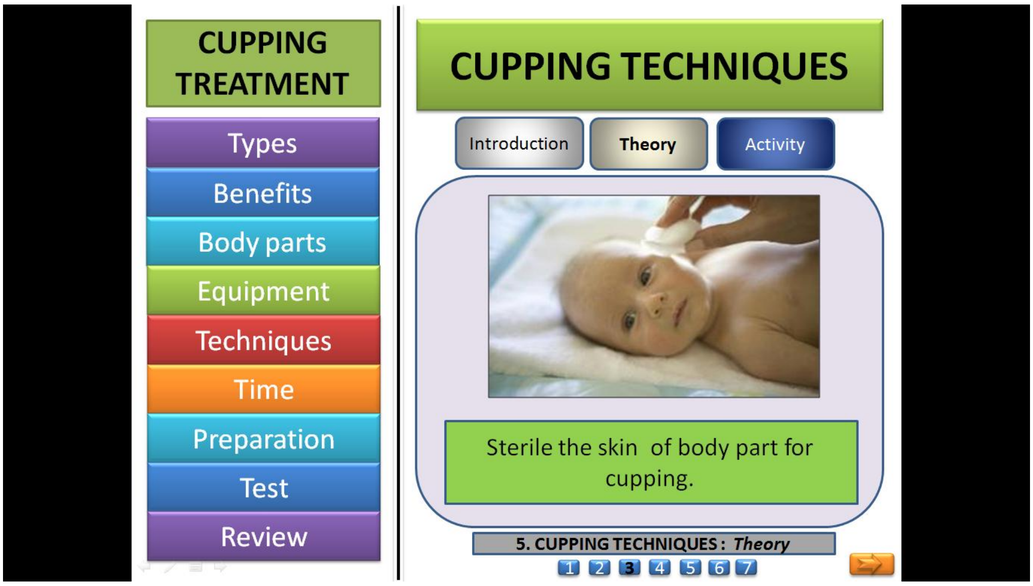
Appendix B1.31: The snapshot shows the objective page of the fifth lesson in 2DC



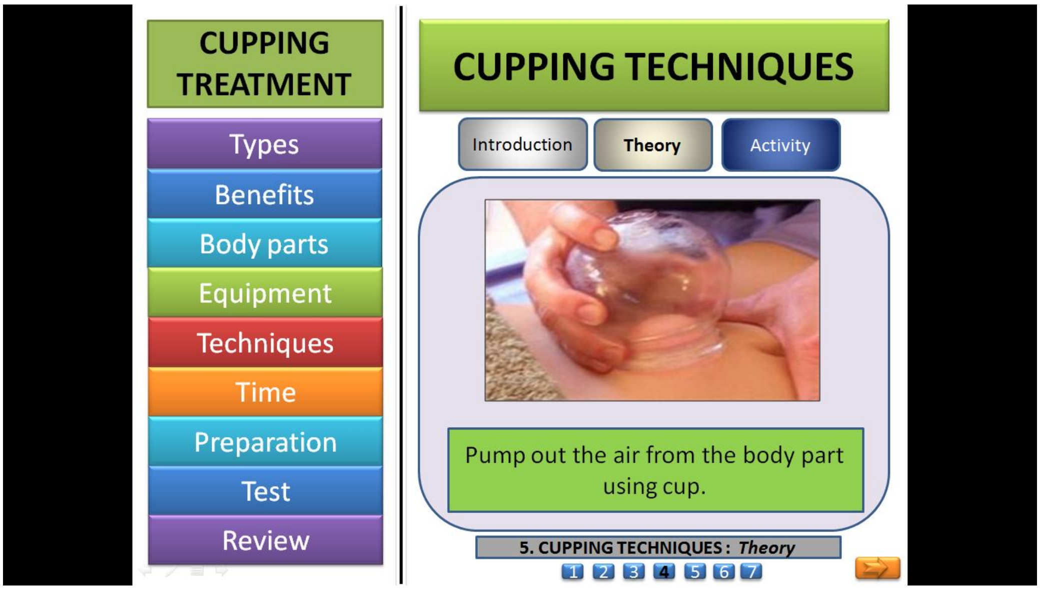
Appendix B1.32: The snapshot shows the first page of the fifth lesson tutorial in 2DC



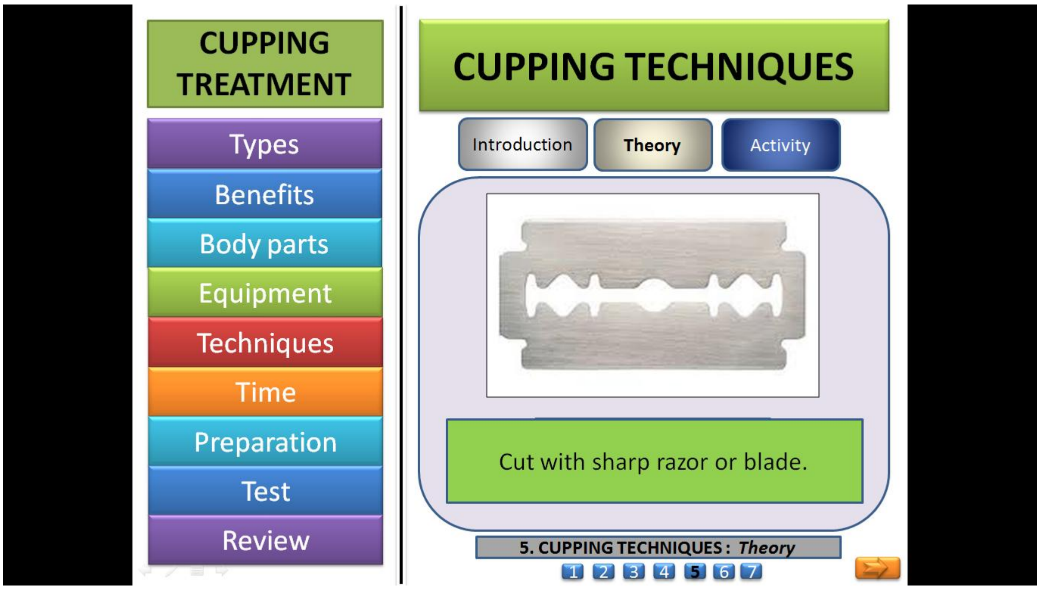
Appendix B1.33: The snapshot shows the second page of the fifth lesson tutorial in 2DC



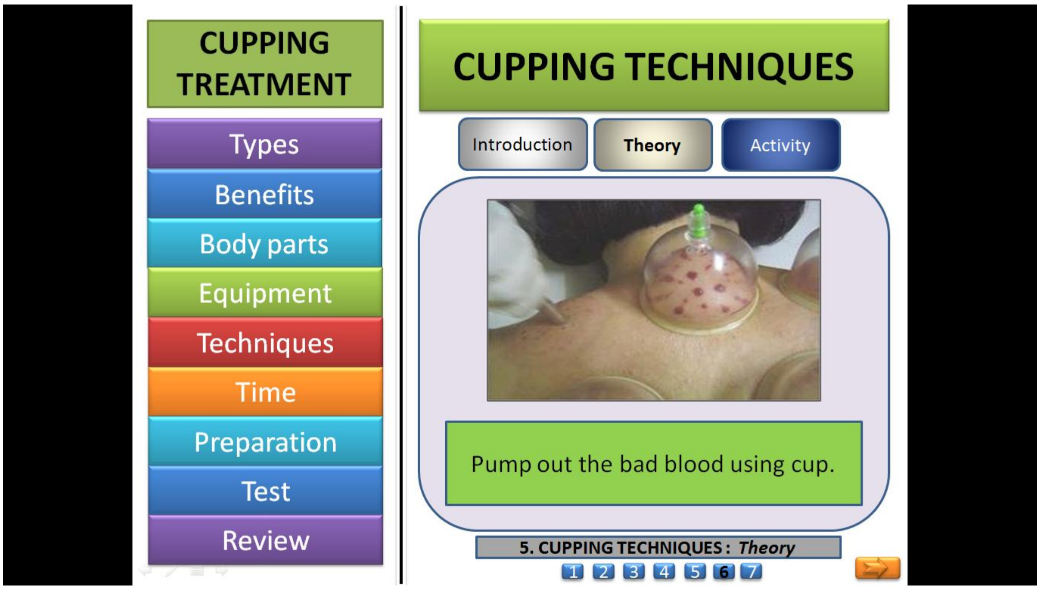
Appendix B1.34: The snapshot shows the third page of the fifth lesson tutorial in 2DC



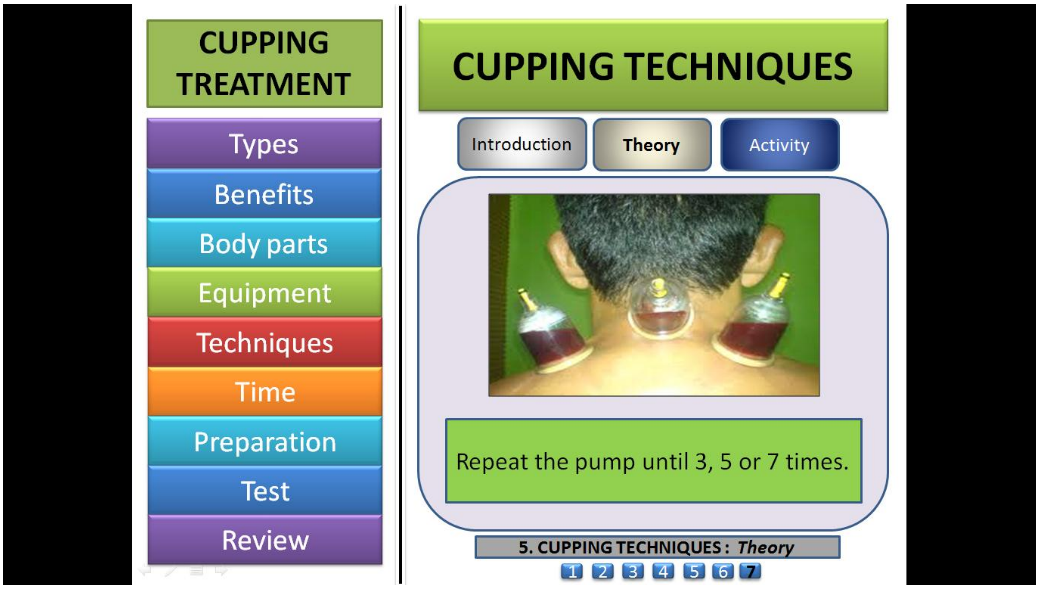
Appendix B1.35: The snapshot shows the fourth page of the fifth lesson tutorial in 2DC



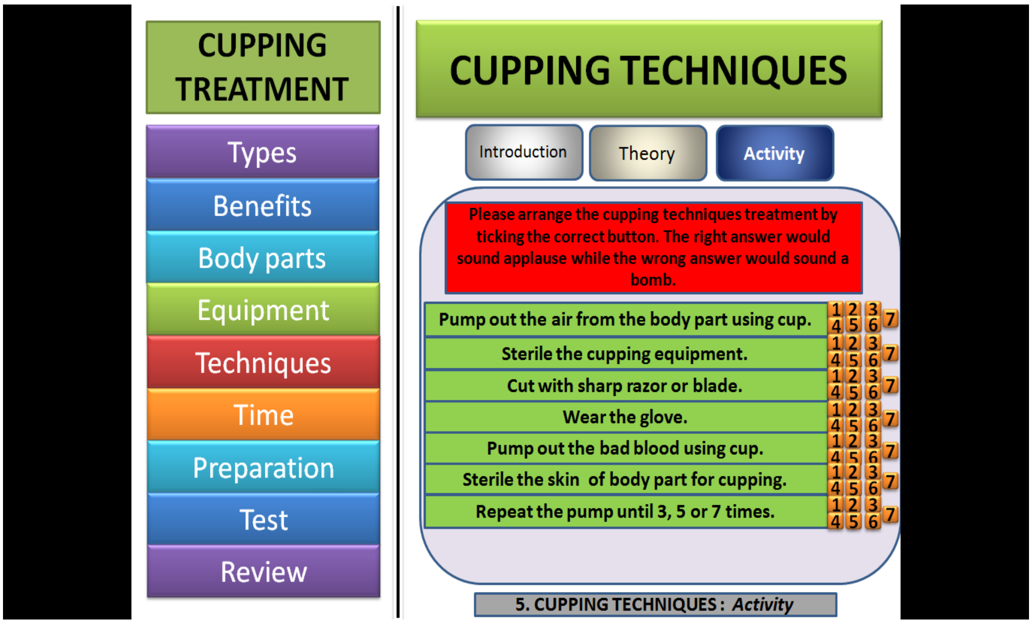
Appendix B1.36: The snapshot shows the fifth page of the fifth lesson tutorial in 2DC



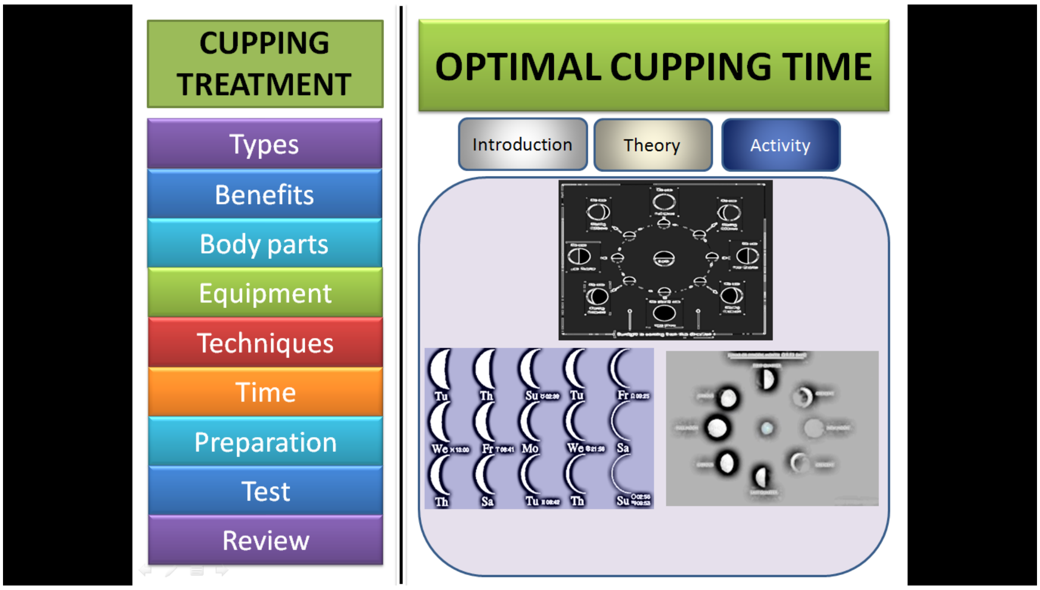
Appendix B1.37: The snapshot shows the sixth page of the fifth lesson tutorial in 2DC



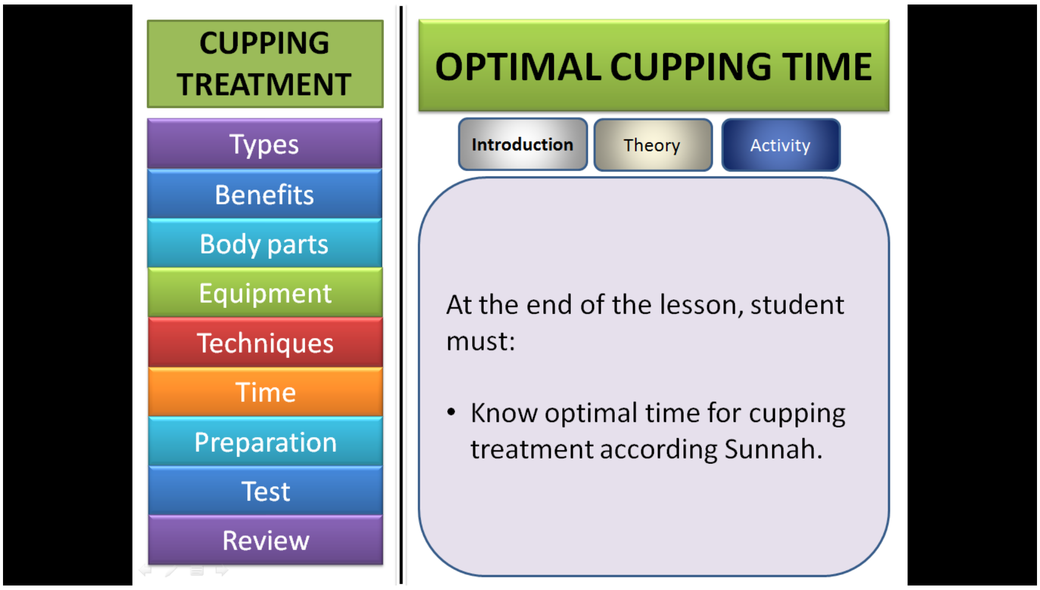
Appendix B1.38: The snapshot shows the seveth page of the fifth lesson tutorial in 2DC



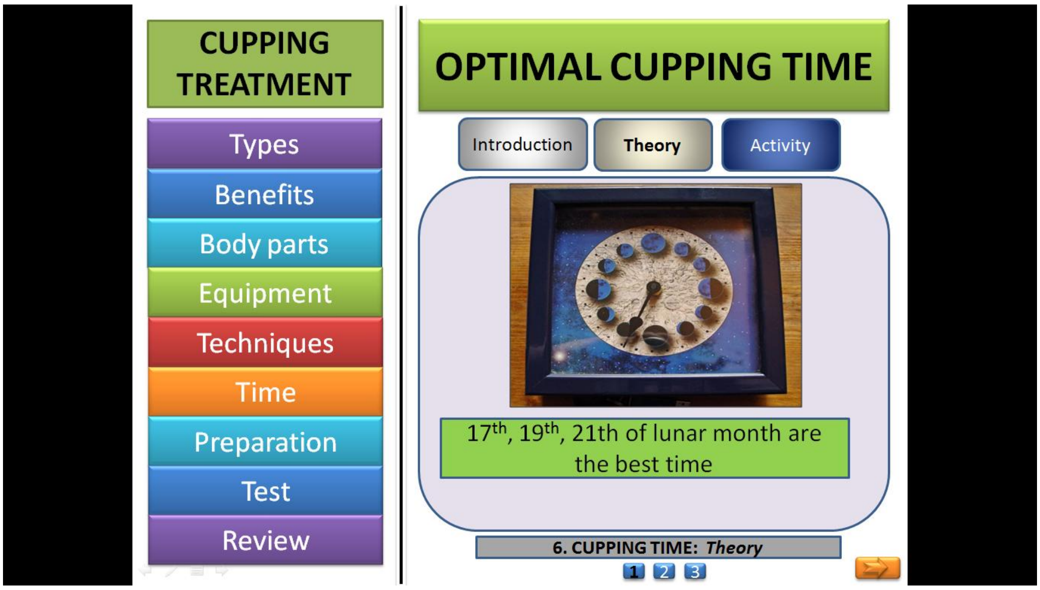
Appendix B1.39: The snapshot shows the quiz page of the fifth lesson tutorial in 2DC



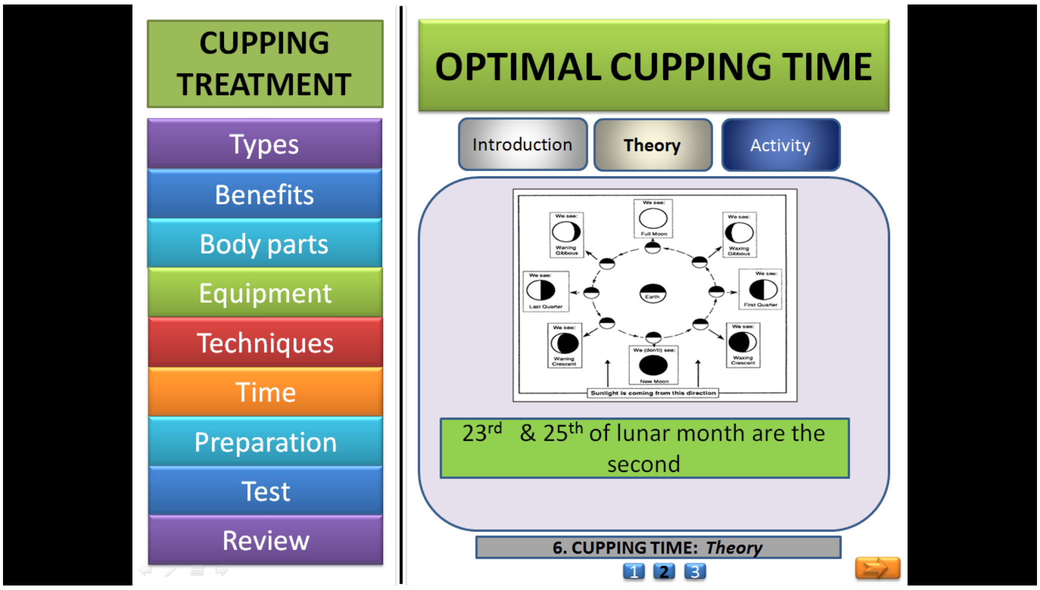
Appendix B1.40: The snapshot shows the front page of the sixth lesson in 2DC



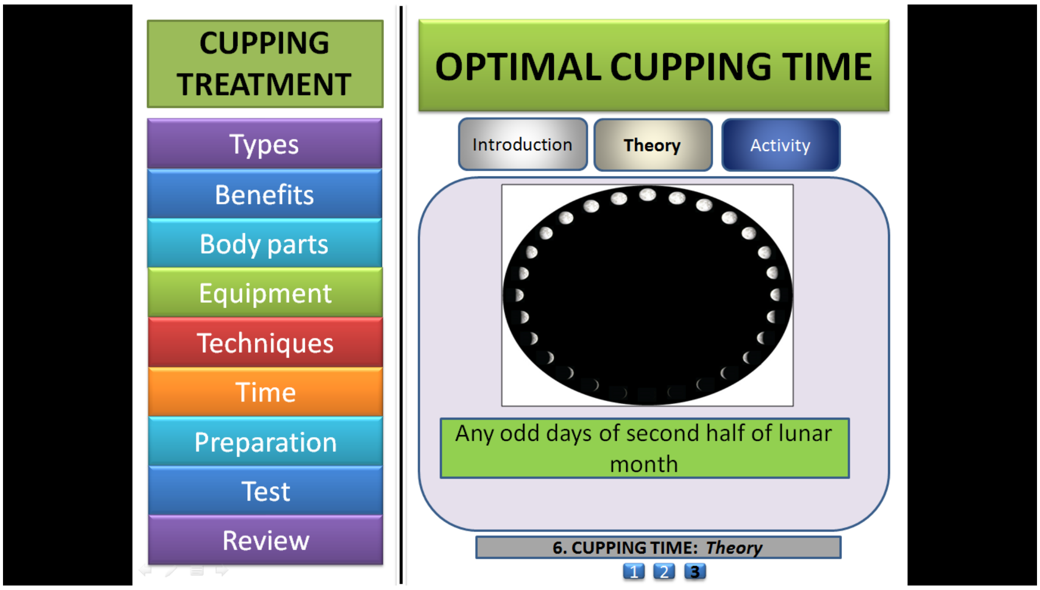
Appendix B1.41: The snapshot shows the objective page of the sixth lesson in 2DC



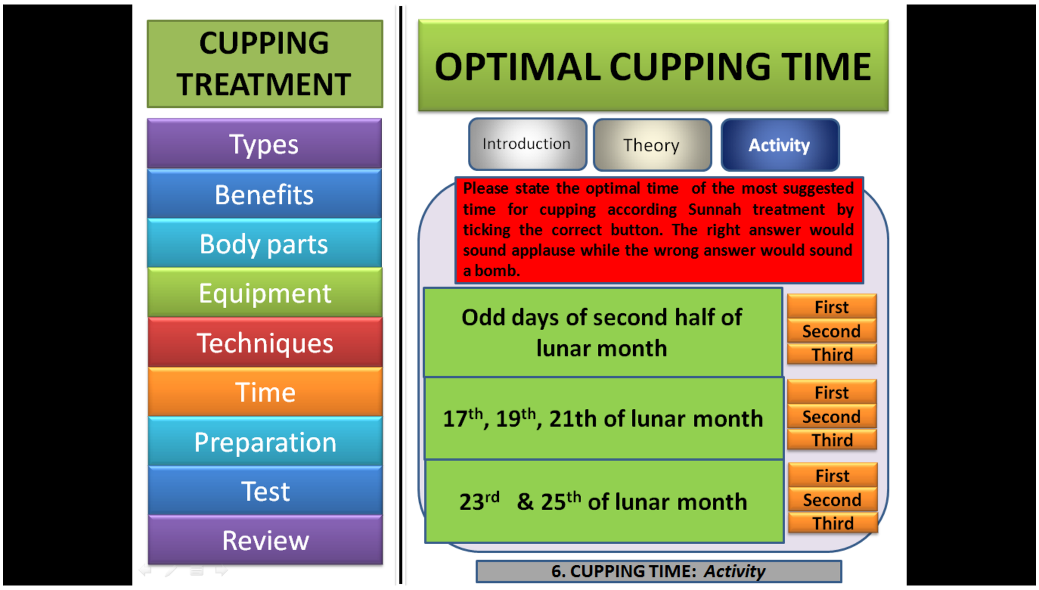
Appendix B1.42: The snapshot shows the first page of the sixth lesson tutorial in 2DC



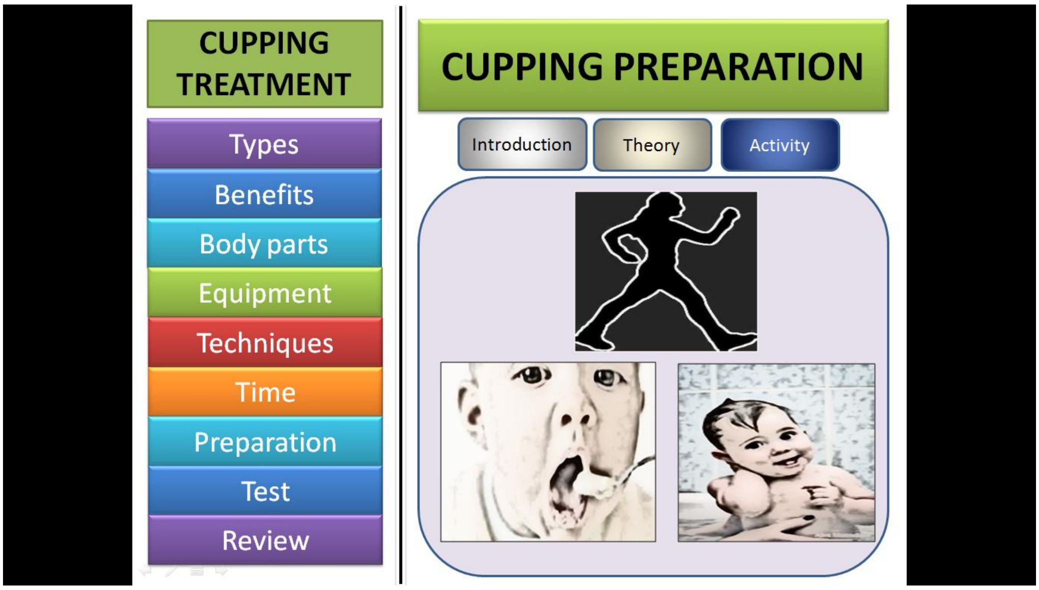
Appendix B1.43: The snapshot shows the second page of the sixth lesson tutorial in 2DC



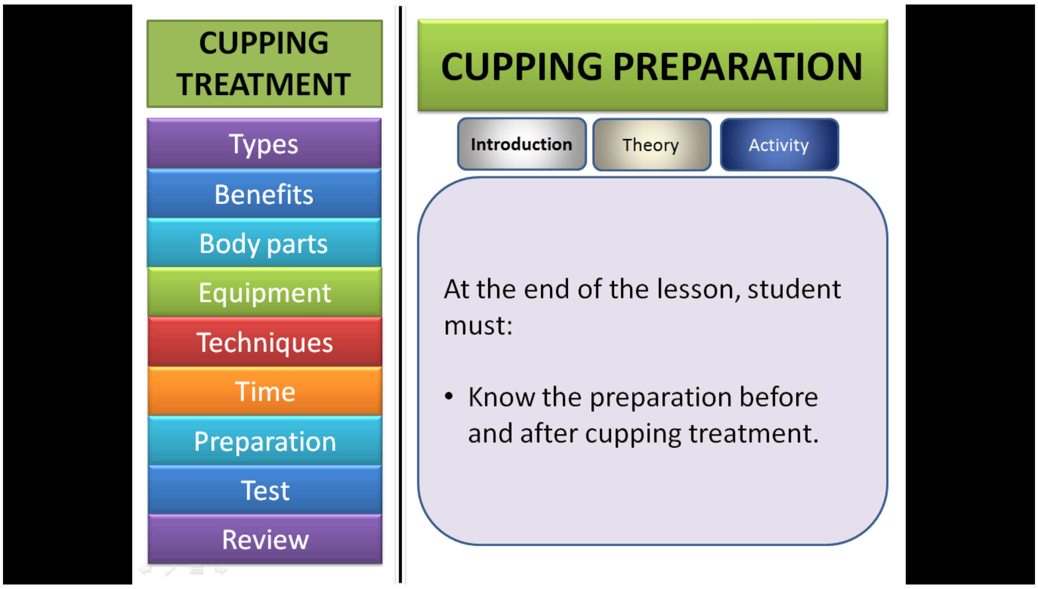
Appendix B1.44: The snapshot shows the third page of the sixth lesson tutorial in 2DC



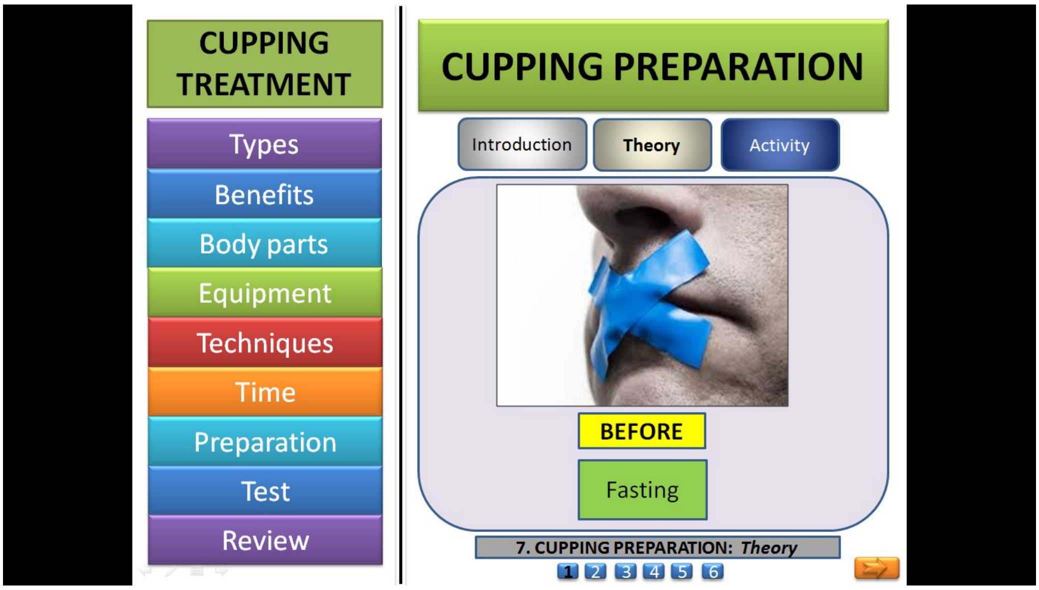
Appendix B1.45: The snapshot shows the quiz page of the sixth lesson tutorial in 2DC



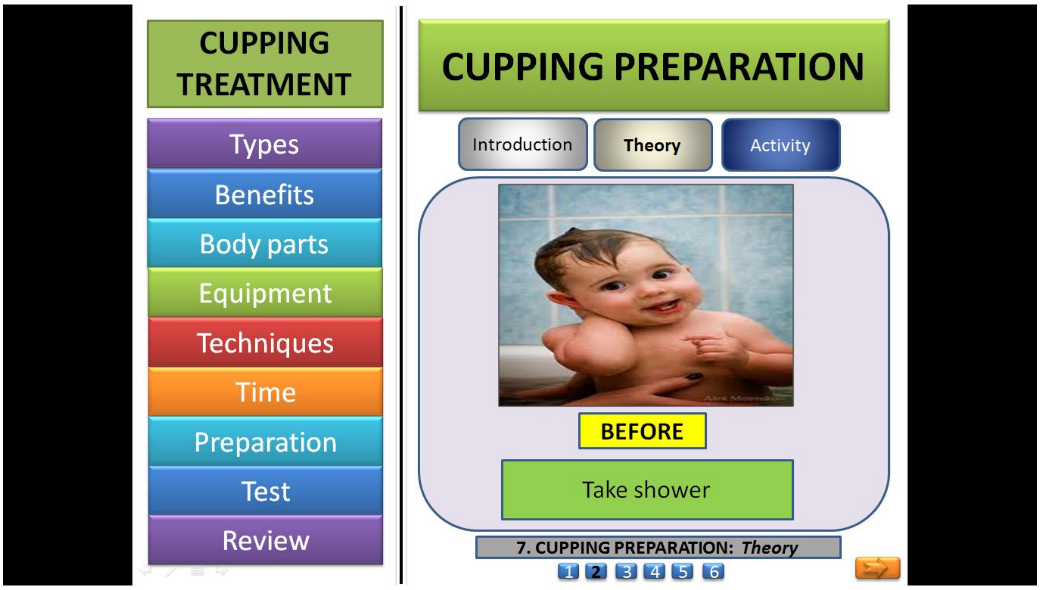
Appendix B1.46: The snapshot shows the front page of the seventh lesson in 2DC



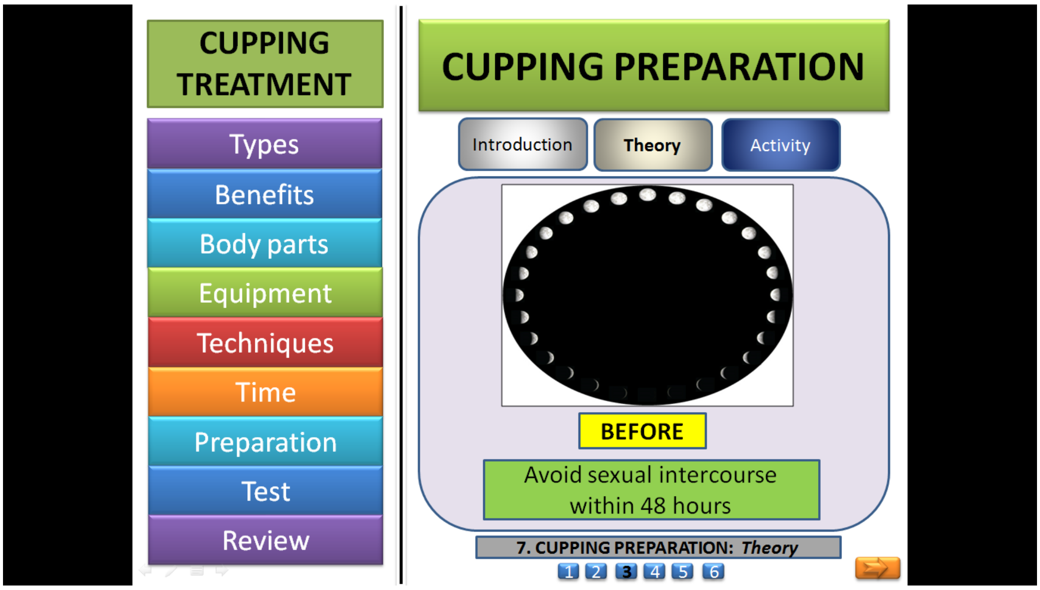
Appendix B1.47: The snapshot shows the objective page of the sevent lesson in 2DC



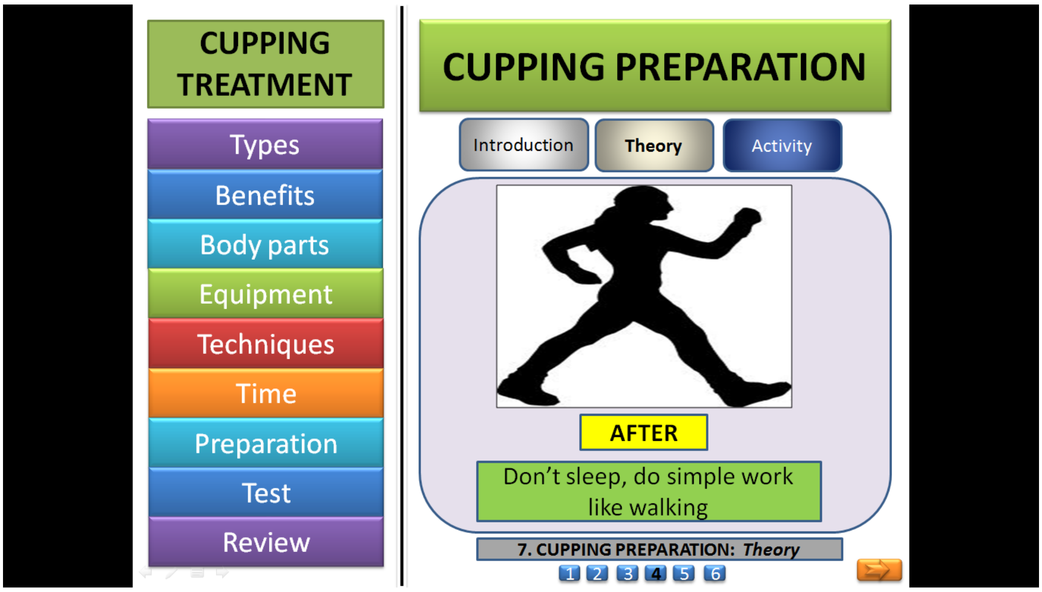
Appendix B1.48: The snapshot shows the first page of the seventh lesson tutorial in 2DC



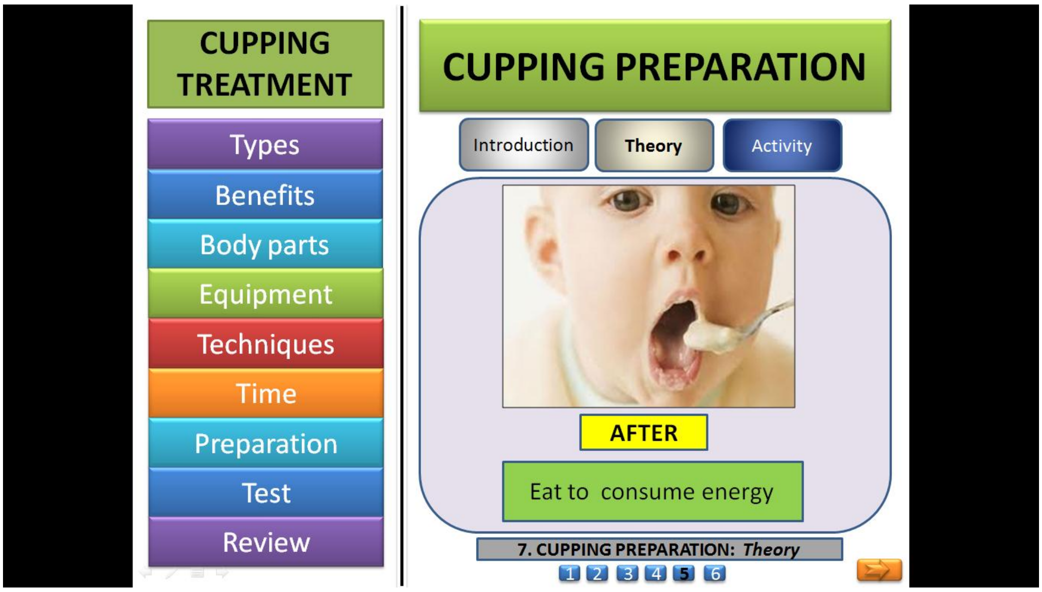
Appendix B1.49: The snapshot shows the second page of the seventh lesson tutorial in 2DC



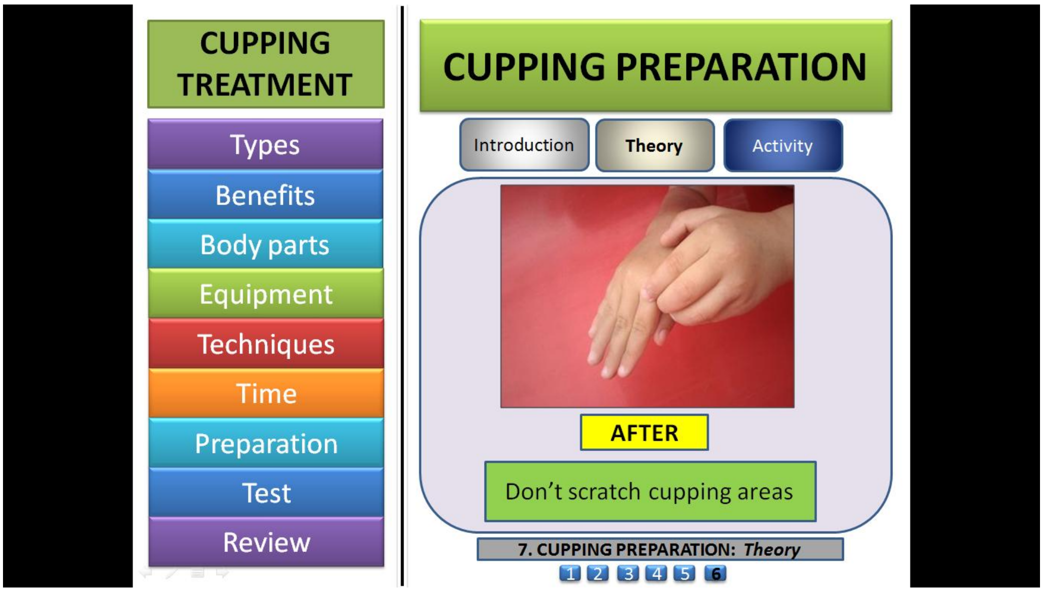
Appendix B1.50: The snapshot shows the third page of the seventh lesson tutorial in 2DC



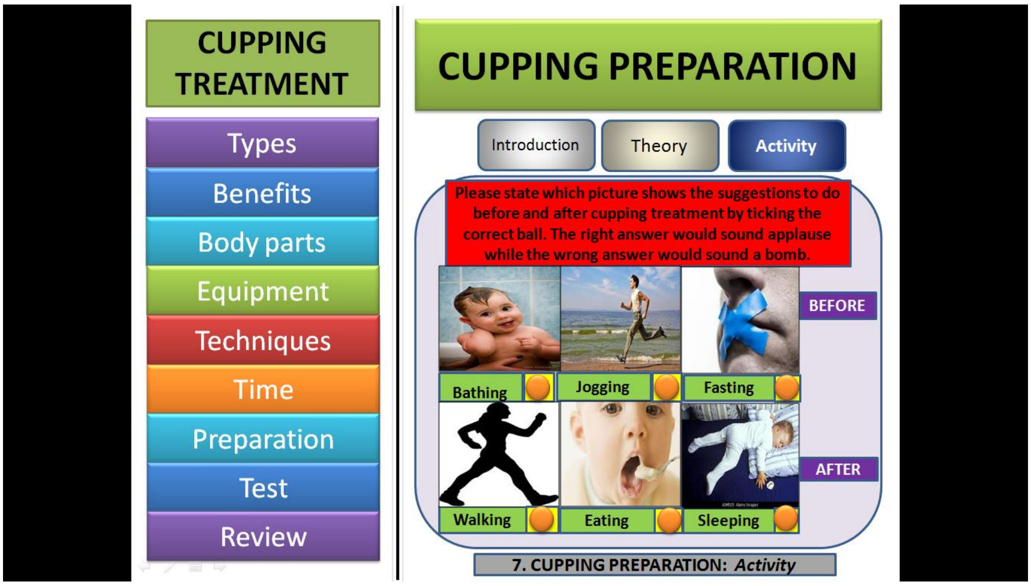
Appendix B1.51: The snapshot shows the fourth page of the seventh lesson tutorial in 2DC



Appendix B1.52: The snapshot shows the fifth page of the seventh lesson tutorial in 2DC

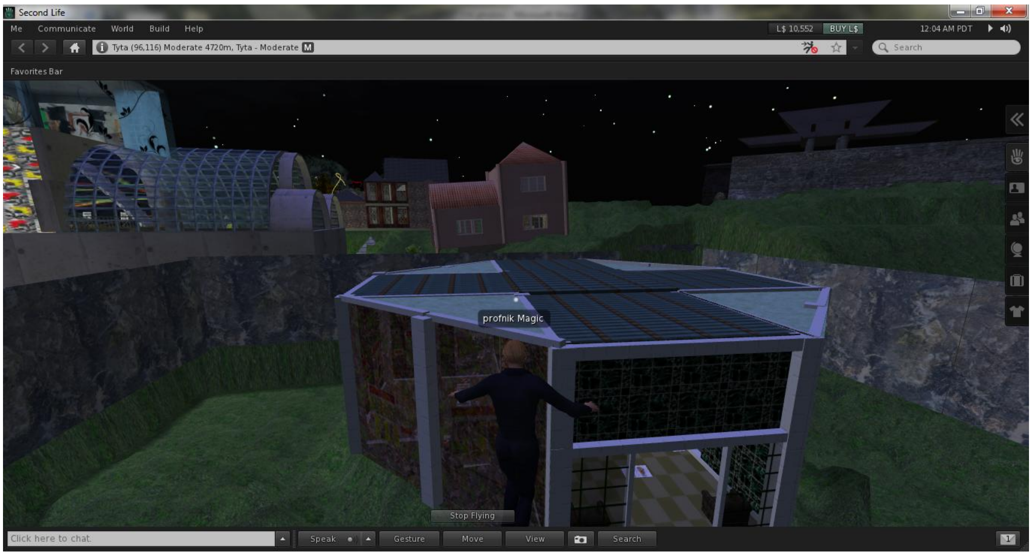


Appendix B1.53: The snapshot shows the sixth page of the seventh lesson tutorial in 2DC

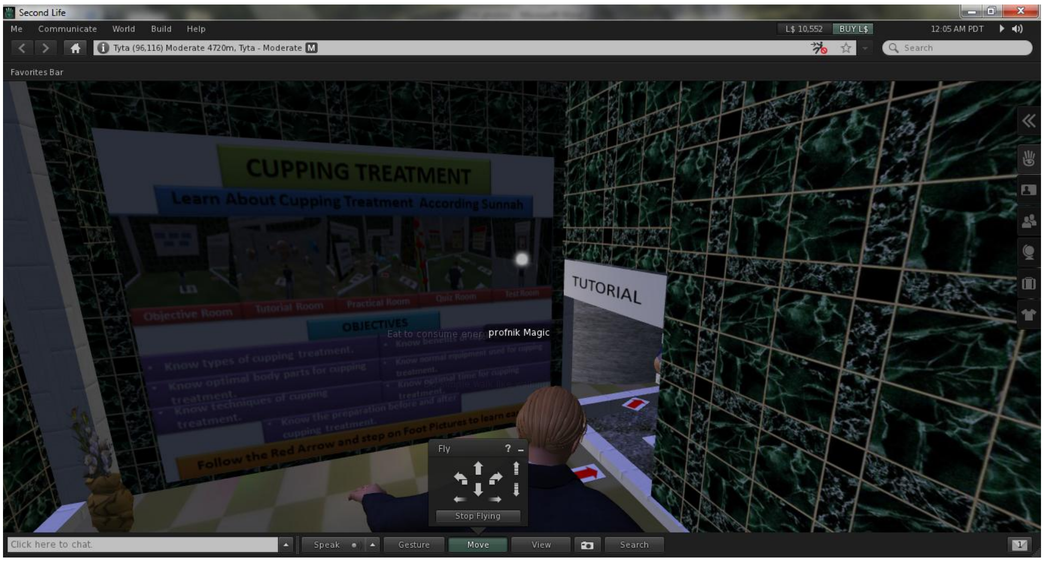


Appendix B1.54: The snapshot shows the quiz page of the seventh lesson tutorial in 2DC

(Appendix B2) The Snapshots of Virtual World Courseware II

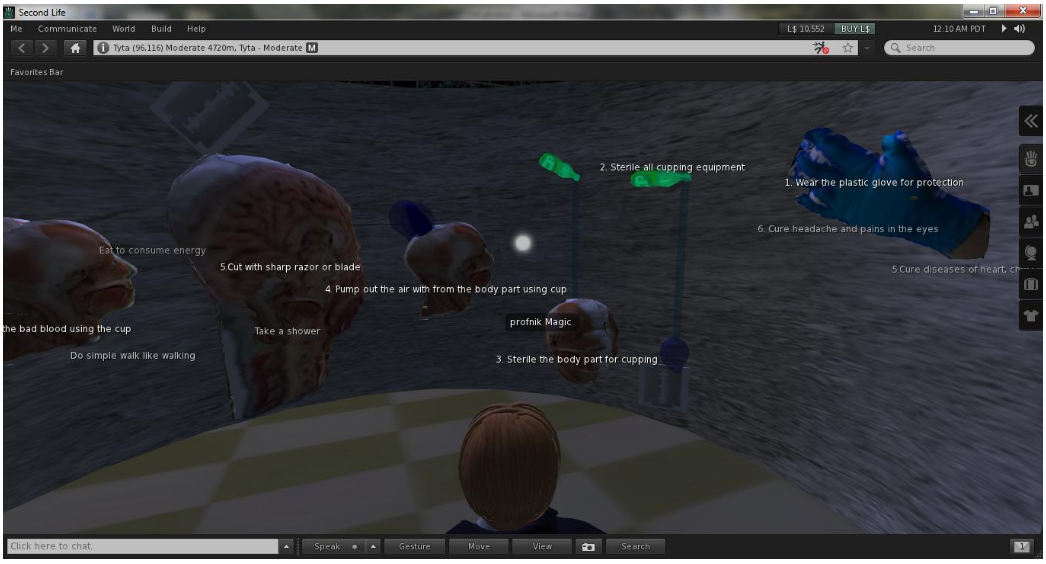


Appendix B2.1: The snapshot shows the 3D building of VWC2



Appendix B2.2: The snapshot shows the Objective Section of the VWC2

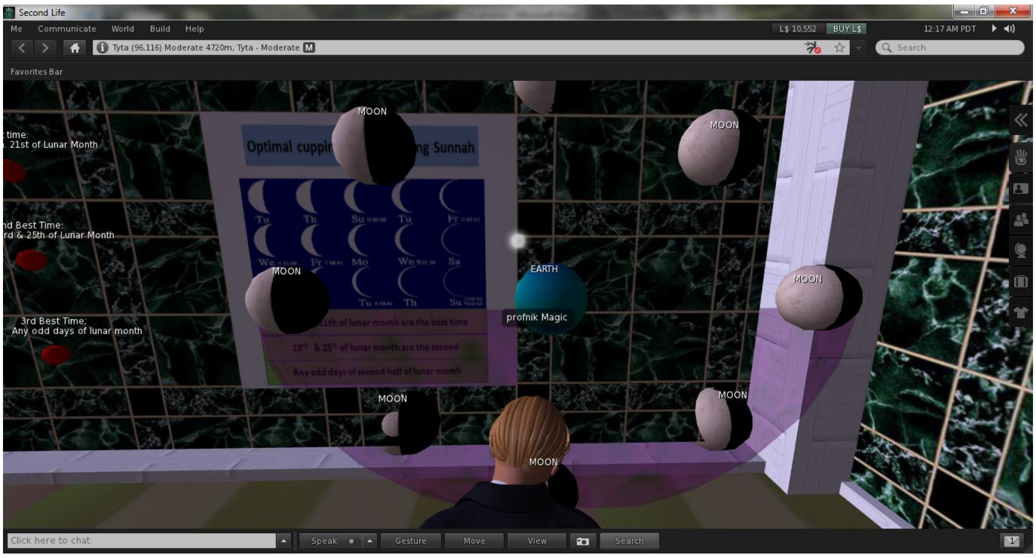
Appendix B2.3: The snapshot shows the first lesson of Tutorial Section in the VWC2



Appendix B2.4: The snapshot shows the second lesson (first part) of Tutorial Section in the VWC2

Appendix B2.5: The snapshot shows the second lesson (second part) of Tutorial Section in the VWC2

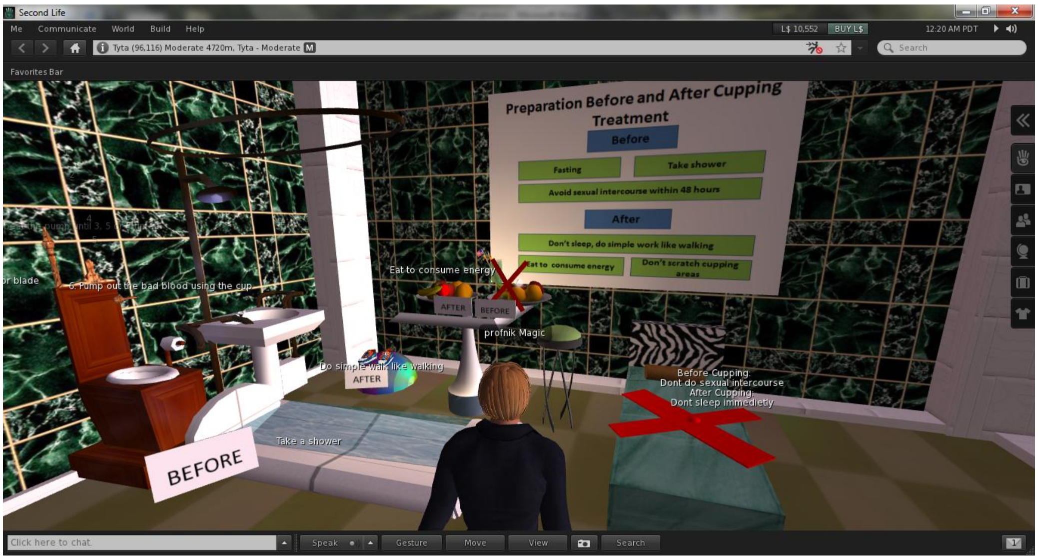
Appendix B2.6: The snapshot shows the third lesson of Tutorial Section in the VWC2



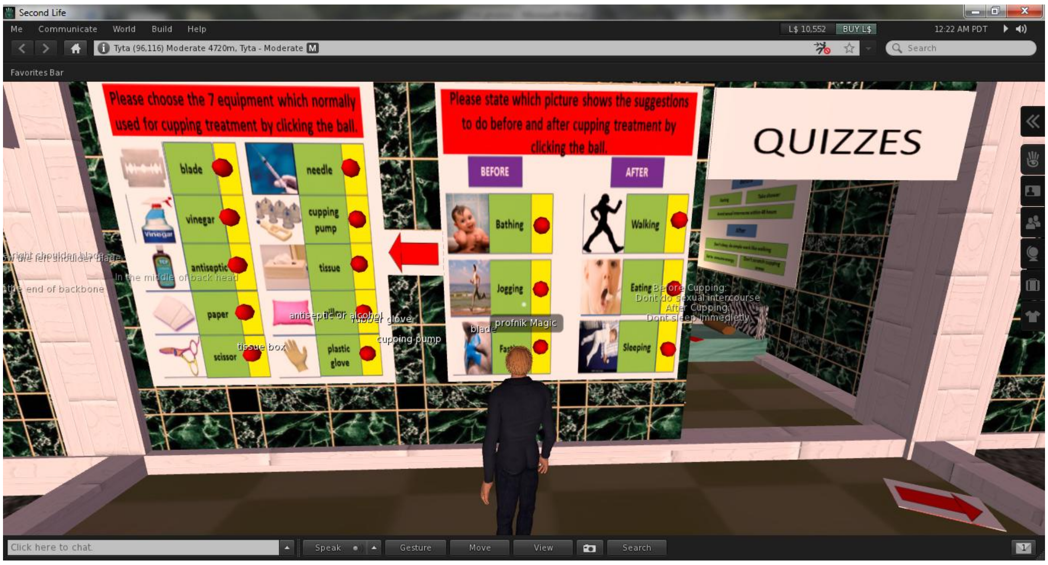
Appendix B2.7: The snapshot shows the forth lesson of Tutorial Section in the VWC2

Appendix B2.8: The snapshot shows the fifth lesson of Tutorial Section in the VWC2

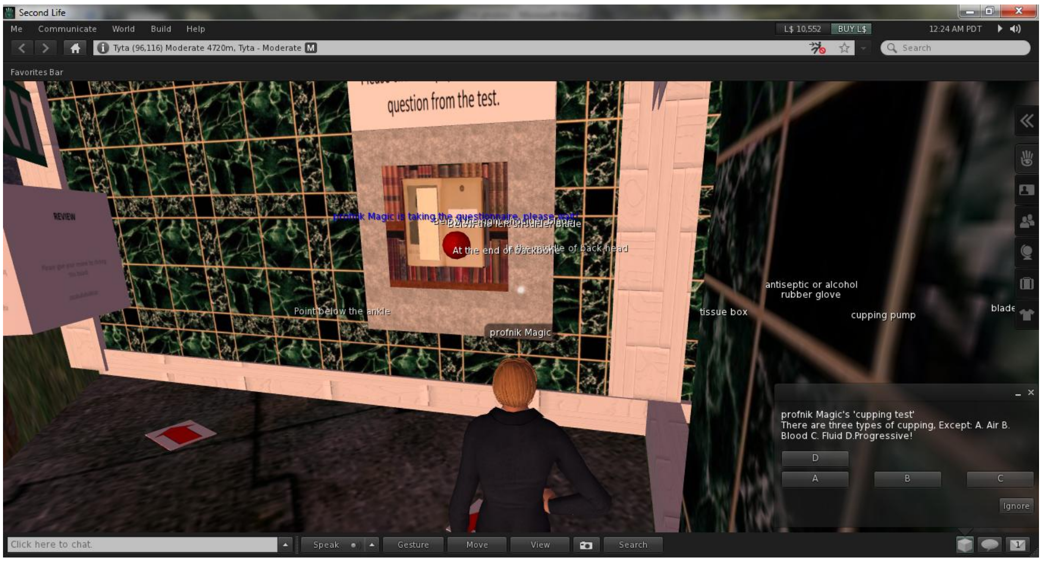
Appendix B2.9: The snapshot shows the sixth lesson of Tutorial Section in the VWC2



Appendix B2.10: The snapshot shows the seveth lesson of Tutorial Section in the VWC2



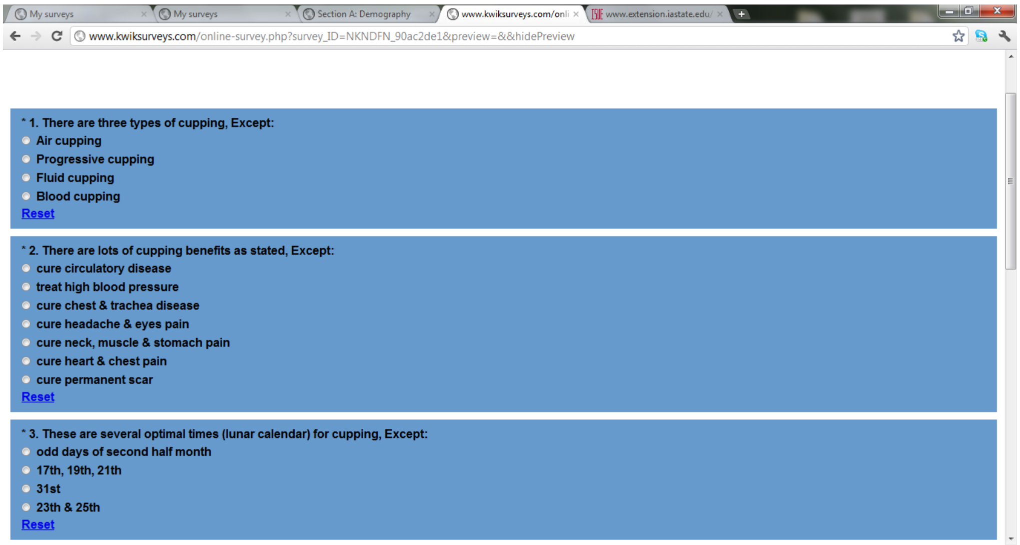
Appendix B2.11: The snapshot shows the Quiz Section in the VWC2



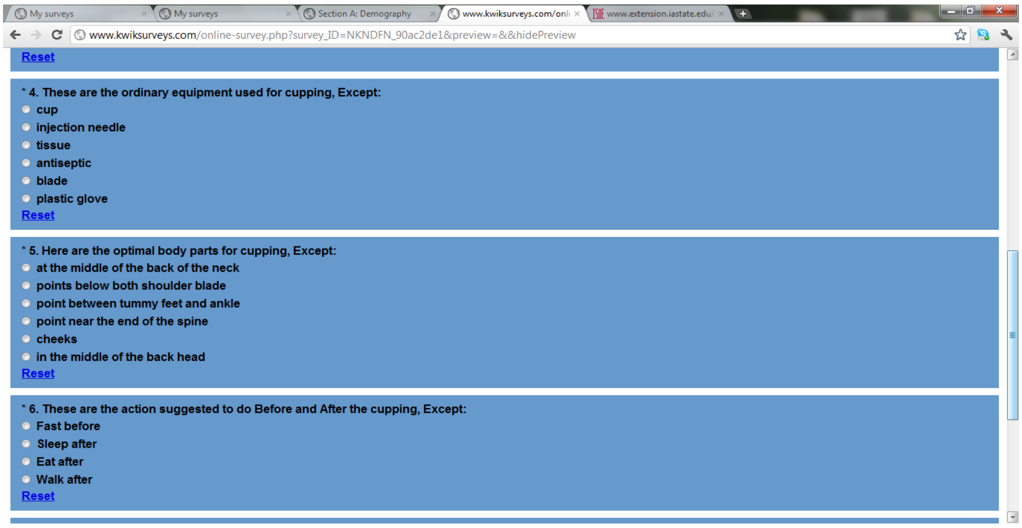
Appendix B2.12: The snapshot shows the Test Section in the VWC2

(Appendix B3) The Test Question Used in the Second Experiment

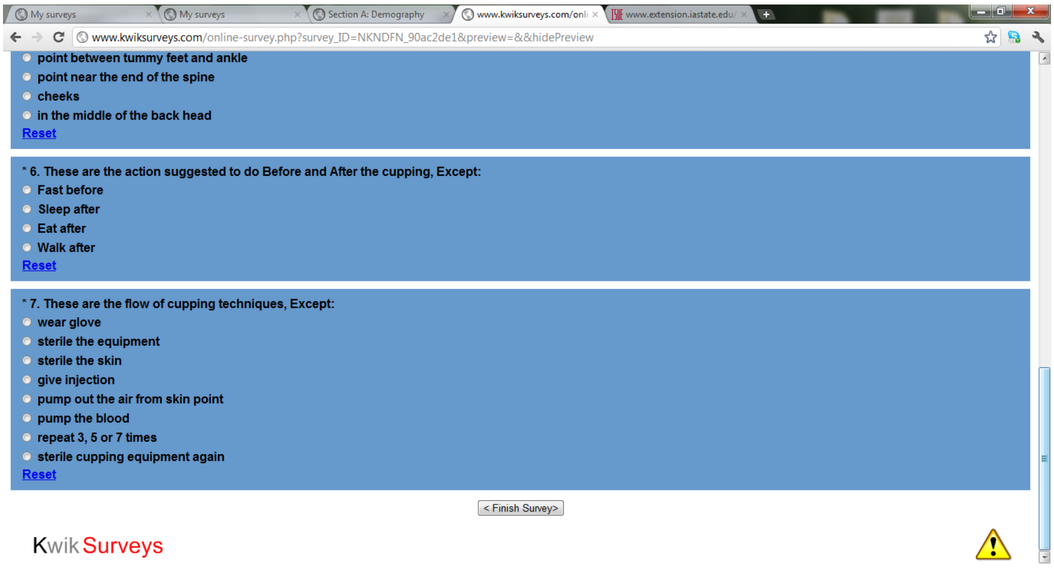
2D



Appendix B3.1: The snapshot shows the test question (1-3) used in the Test Section of both 2DC and VWC2



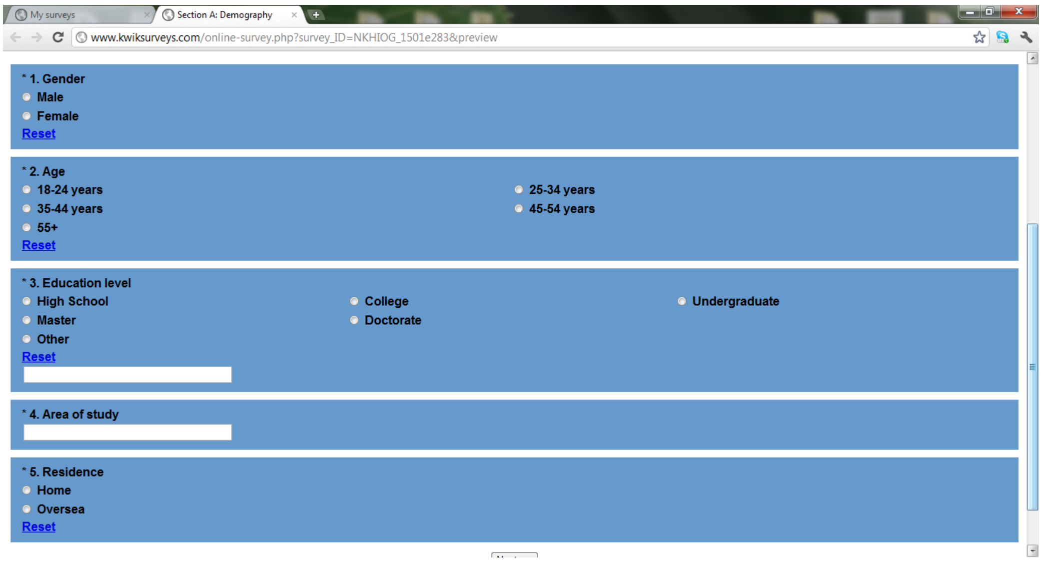
Appendix B3.2: The snapshot shows the test question (4-6) used in the Test Section of both 2DC and VWC2



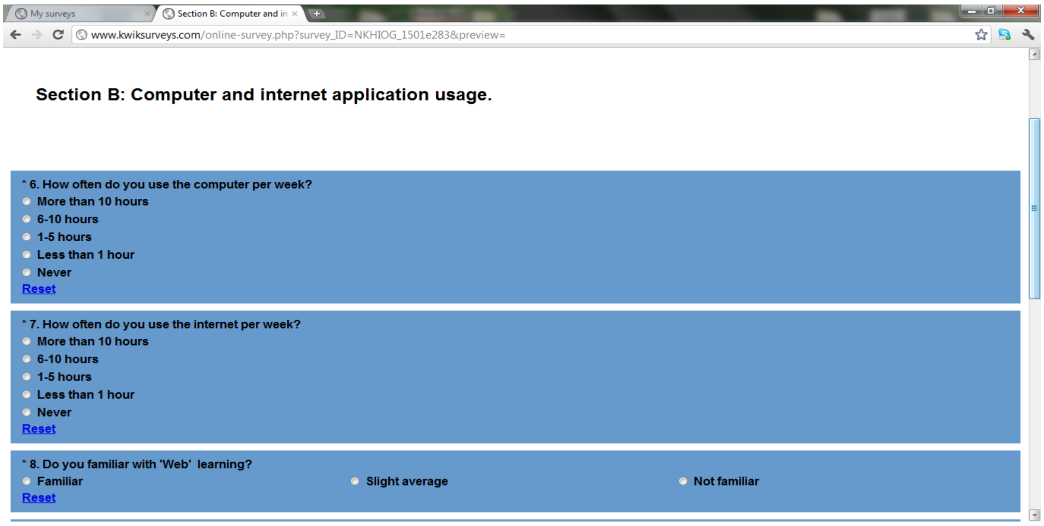
Appendix B3.3: The snapshot shows the test question (6-7) used in the Test Section of both 2DC and VWC2

(Appendix B4) The Questionnaire Used in the Third Experiment

Pre questionnaire



Appendix B4.1: The snapshot shows the questionnaire of user profile in the second experiment



My surveys | Section B: Computer and in

www.kwiksurveys.com/online-survey.php?survey_ID=NKHIOG_1501e283&preview=

Section B: Computer and internet application usage.

* 6. How often do you use the computer per week?
- More than 10 hours
- 6-10 hours
- 1-5 hours
- Less than 1 hour
- Never

Reset

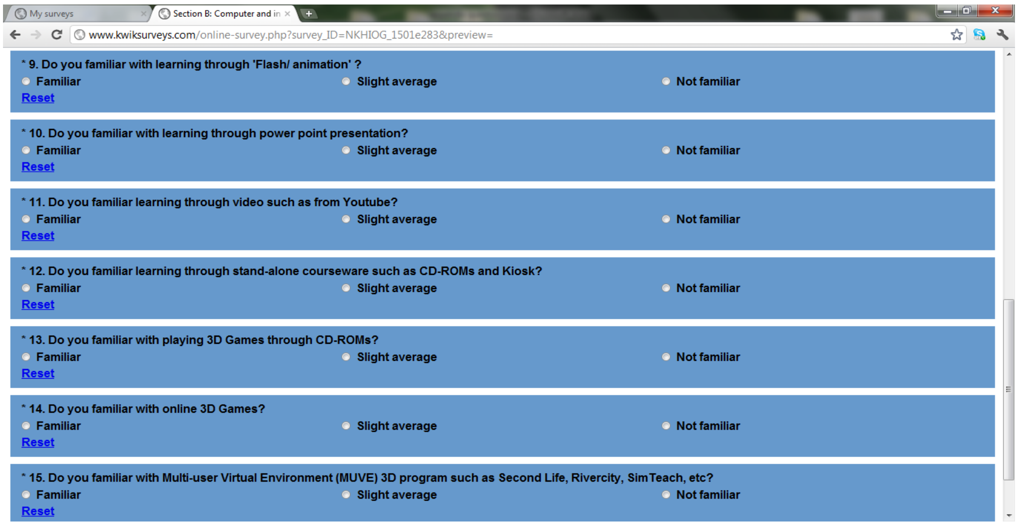
* 7. How often do you use the internet per week?
- More than 10 hours
- 6-10 hours
- 1-5 hours
- Less than 1 hour
- Never

Reset

* 8. Do you familiar with 'Web' learning?
- Familiar
- Slight average
- Not familiar

Reset

Appendix B4.2: The snapshot shows the questionnaire of first user experience in the second experiment



My surveys | Section B: Computer and in

www.kwiksurveys.com/online-survey.php?survey_ID=NKHIOG_1501e283&preview=

* 9. Do you familiar with learning through 'Flash/ animation' ?
- Familiar
- Slight average
- Not familiar

Reset

* 10. Do you familiar with learning through power point presentation?
- Familiar
- Slight average
- Not familiar

Reset

* 11. Do you familiar learning through video such as from Youtube?
- Familiar
- Slight average
- Not familiar

Reset

* 12. Do you familiar learning through stand-alone courseware such as CD-ROMs and Kiosk?
- Familiar
- Slight average
- Not familiar

Reset

* 13. Do you familiar with playing 3D Games through CD-ROMs?
- Familiar
- Slight average
- Not familiar

Reset

* 14. Do you familiar with online 3D Games?
- Familiar
- Slight average
- Not familiar

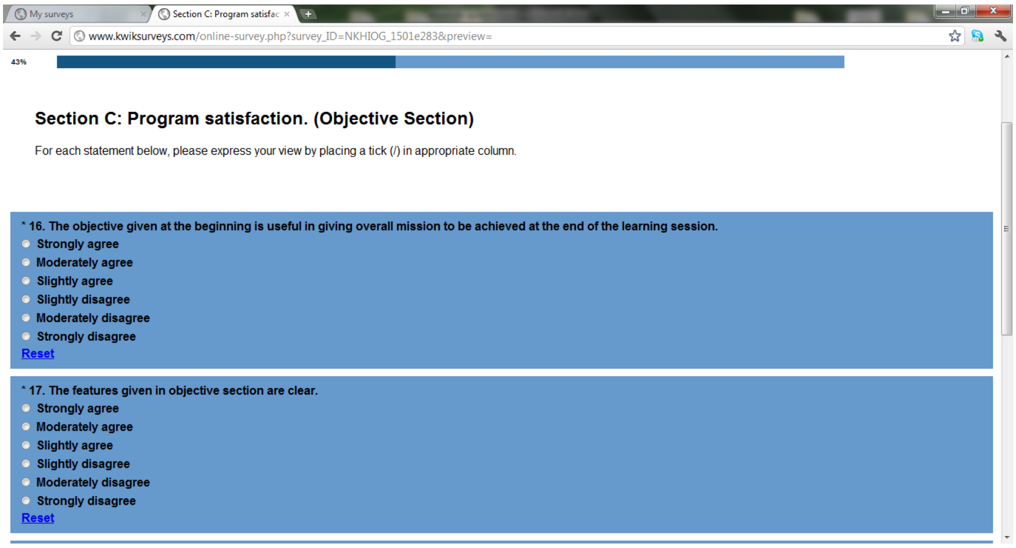
Reset

* 15. Do you familiar with Multi-user Virtual Environment (MUVE) 3D program such as Second Life, Rivercity, SimTeach, etc?
- Familiar
- Slight average
- Not familiar

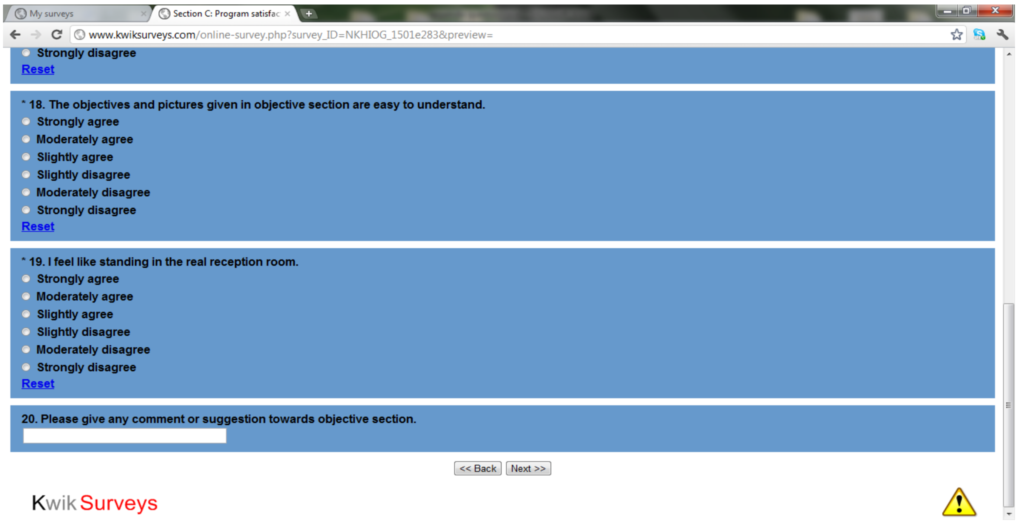
Reset

Appendix B4.3: The snapshot shows the questionnaire of second user experience in the second experiment

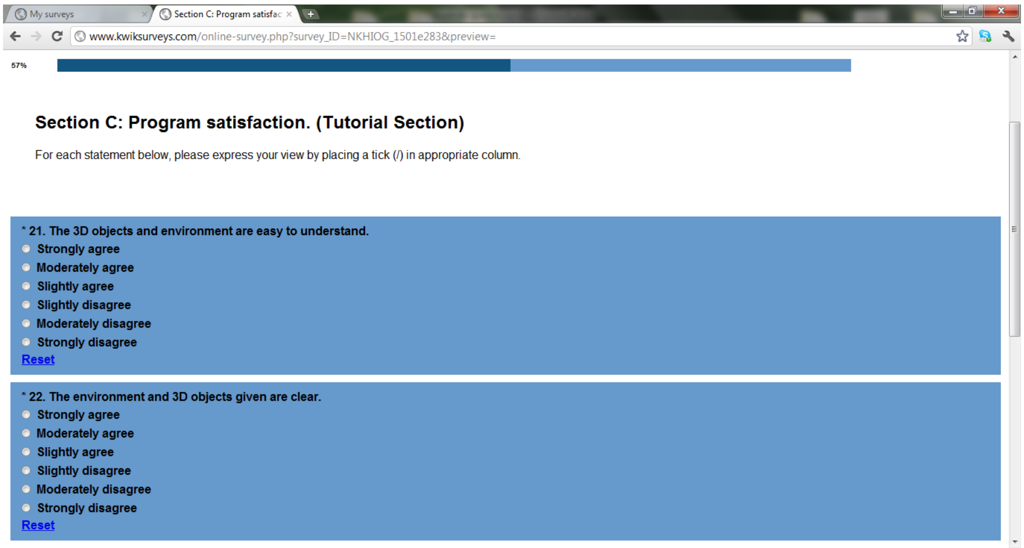
Post questionnaire



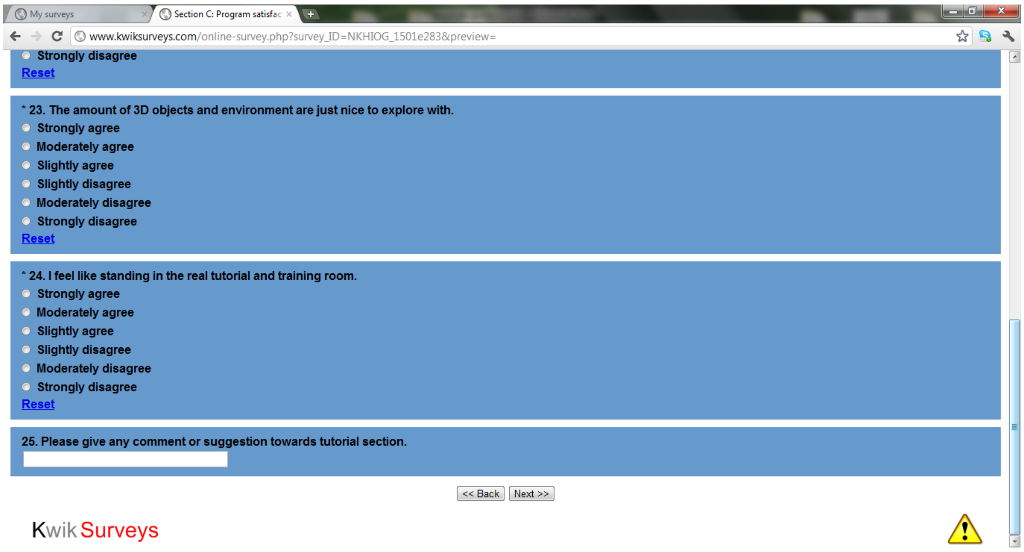
Appendix B4.4: The snapshot shows the questionnaire of objective section (1 and 2) user perception in the second experiment



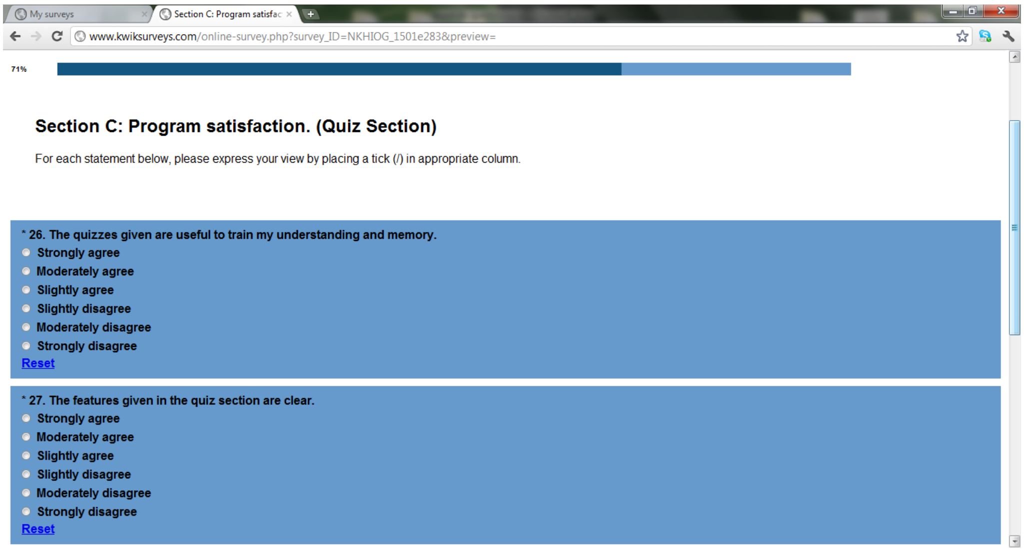
Appendix B4.5: The snapshot shows the questionnaire of objective section (3 and 4) user perception in the second experiment



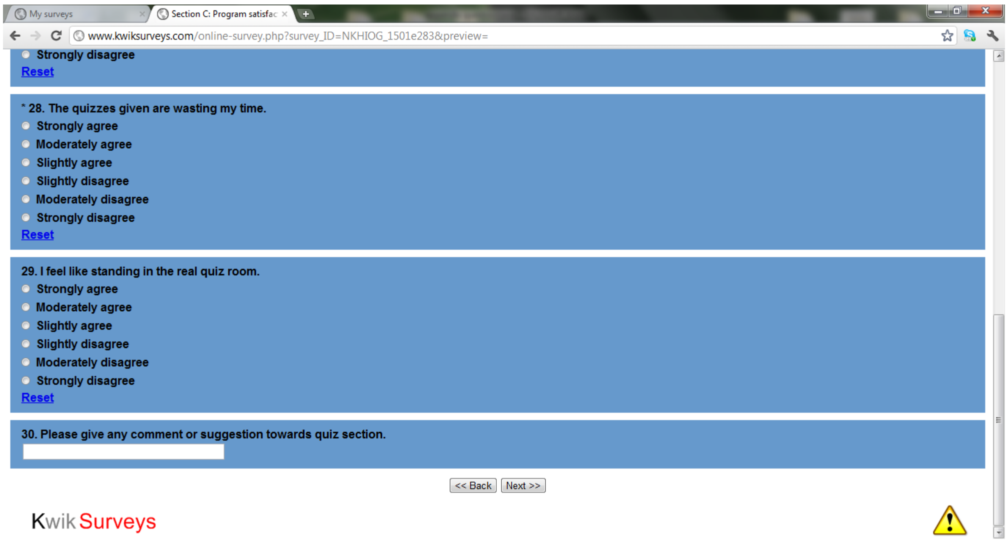
Appendix B4.6: The snapshot shows the questionnaire of tutorial section (1 and 2) user perception in the second experiment



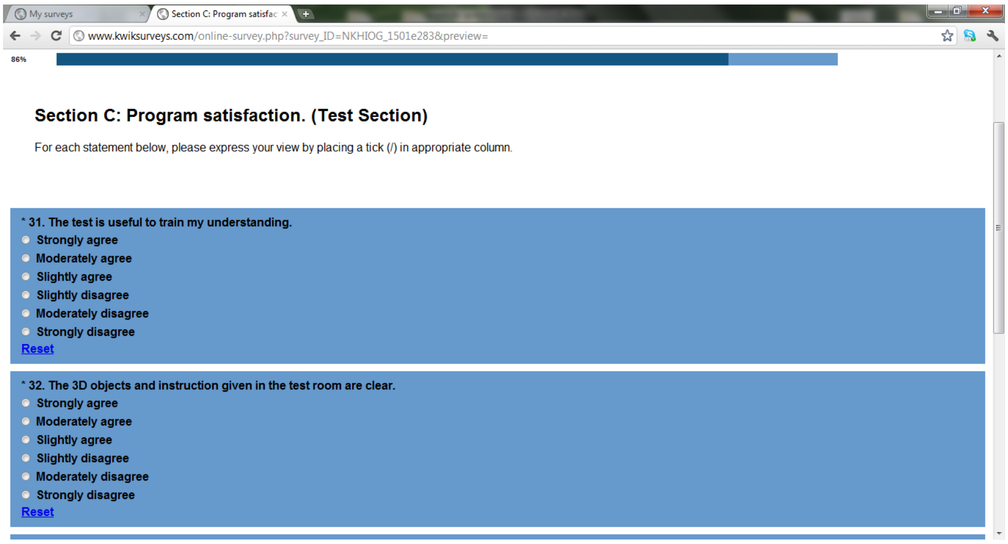
Appendix B4.7: The snapshot shows the questionnaire of tutorial section (3 and 4) user perception in the second experiment



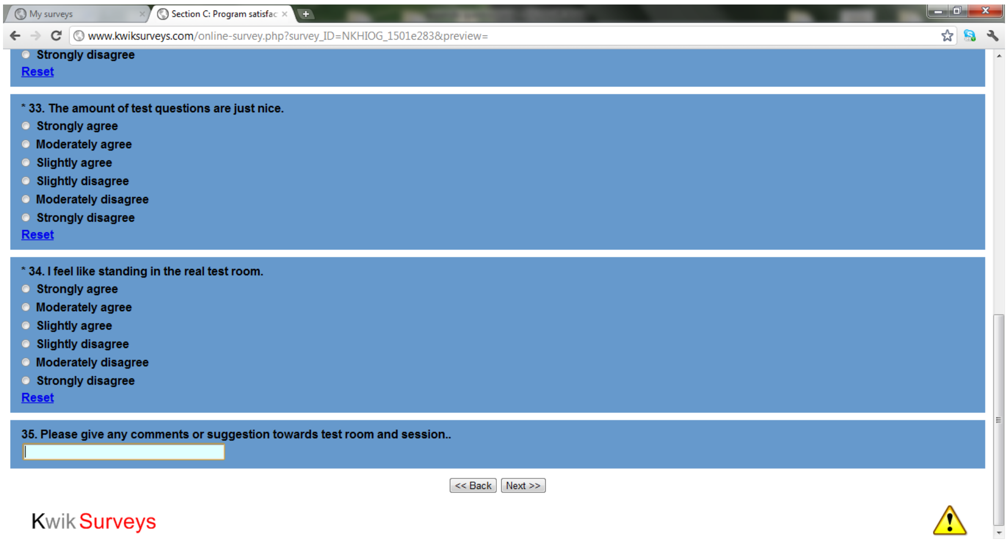
Appendix B4.8: The snapshot shows the questionnaire of quiz section (1 and 2) user perception in the second experiment



Appendix B4.9: The snapshot shows the questionnaire of tutorial section (3 and 4) user perception in the second experiment



Appendix B4.10: The snapshot shows the questionnaire of test section (1 and 2) user perception in the second experiment



Appendix B4.11: The snapshot shows the questionnaire of test section (3 and 4) user perception in the second experiment

* 36. Do you found learning through this courseware ' focused and interesting ' ?
- Yes
- No

Reset

* 37. Do you found learning through this courseware 'helpful' ?
- Yes
- No

Reset

38. Do you found learning through this courseware ' frustrated' ?
- Yes
- No

Reset

39. Do you found learning through this courseware ' annoyed and boring' ?
- Yes
- No

Reset

40. What is your preferred learning interface?
- 2D interface (web/ flash/ etc)
- 3D online environment experience learning (MUVE/Games/ Virtual World)

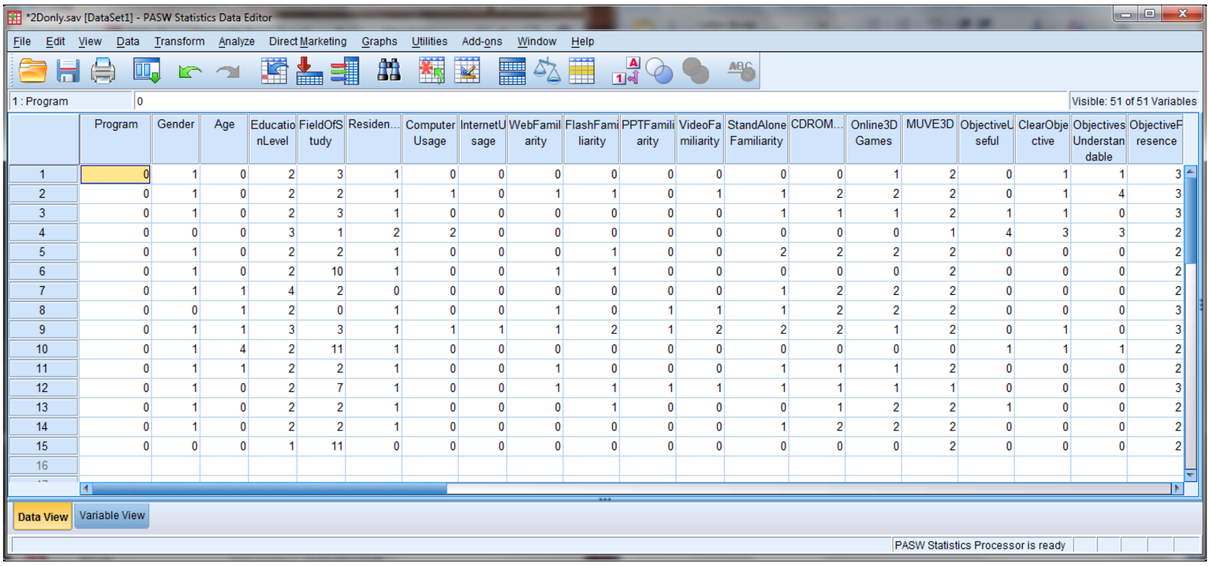
Reset

* 41. What is your overall comment or suggestion towards this courseware presentation?

Appendix B4.12: The snapshot shows the questionnaire of user satisfaction in the second experiment

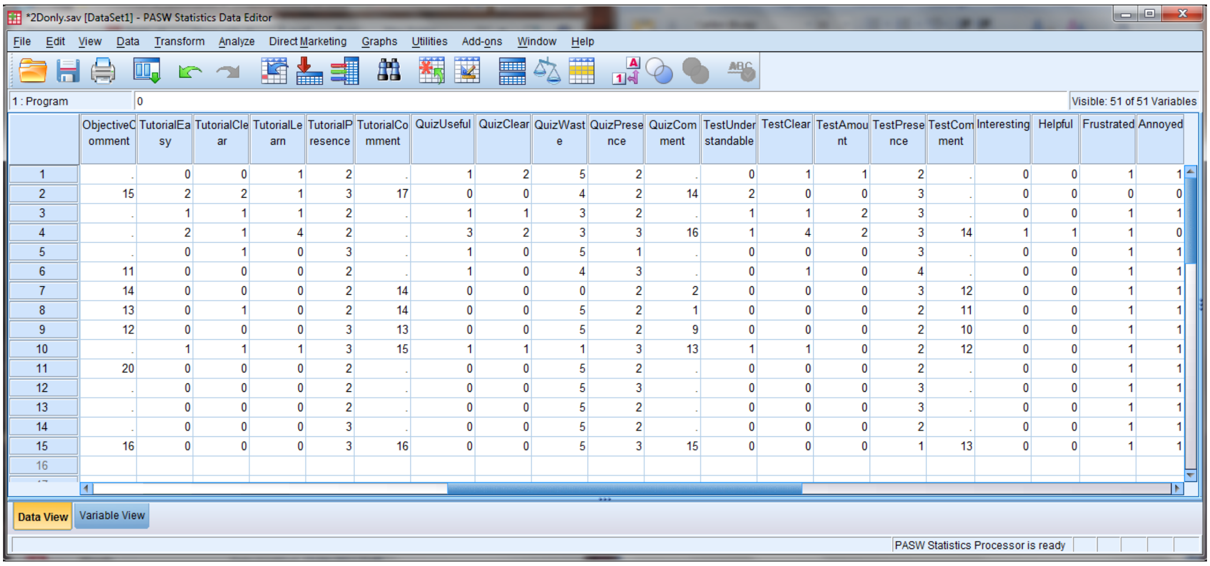
(Appendix B5) The Raw Data of the Second Experiment

2DC



	Program	Gender	Age	EducationLevel	FieldOfStudy	Residen...	ComputerUsage	InternetUsage	WebFamiliarity	FlashFamiliarity	PPTFamiliarity	VideoFamiliarity	StandAloneFamiliarity	CDROM...	Online3DGames	MUVE3D	ObjectiveUseful	ClearObjective	ObjectivesUnderstandable	ObjectivePresence
1	0	1	0	2	3	1	0	0	0	0	0	0	0	0	1	2	0	1	1	3
2	0	1	0	2	2	1	1	0	1	1	0	1	1	2	2	2	0	1	4	3
3	0	1	0	2	3	1	0	0	0	0	0	0	1	1	1	2	1	1	0	3
4	0	0	0	3	1	2	2	0	0	0	0	0	0	0	0	1	4	3	3	2
5	0	1	0	2	2	1	0	0	0	1	0	0	2	2	2	2	0	0	0	2
6	0	1	0	2	10	1	0	0	1	1	0	0	0	0	0	2	0	0	0	2
7	0	1	1	4	2	0	0	0	0	0	0	0	1	2	2	2	0	0	0	2
8	0	0	1	2	0	1	0	0	1	0	1	1	1	2	2	2	0	0	0	3
9	0	1	1	3	3	1	1	1	1	2	1	2	2	2	1	2	0	1	0	3
10	0	1	4	2	11	1	0	0	0	0	0	0	0	0	0	0	1	1	1	2
11	0	1	1	2	2	1	0	0	1	0	0	0	1	1	1	2	0	0	0	2
12	0	1	0	2	7	1	0	0	1	1	1	1	1	1	1	1	0	0	0	3
13	0	1	0	2	2	1	0	0	0	1	0	0	0	1	2	2	1	0	0	2
14	0	1	0	2	2	1	0	0	0	0	0	0	1	2	2	2	0	0	0	2
15	0	0	0	1	11	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2
16																				

Appendix B5.1: The snapshot shows the raw data of 2DC user profile in the second experiment



*2Donly.sav [DataSet1] - PASW Statistics Data Editor

1 : Program 0

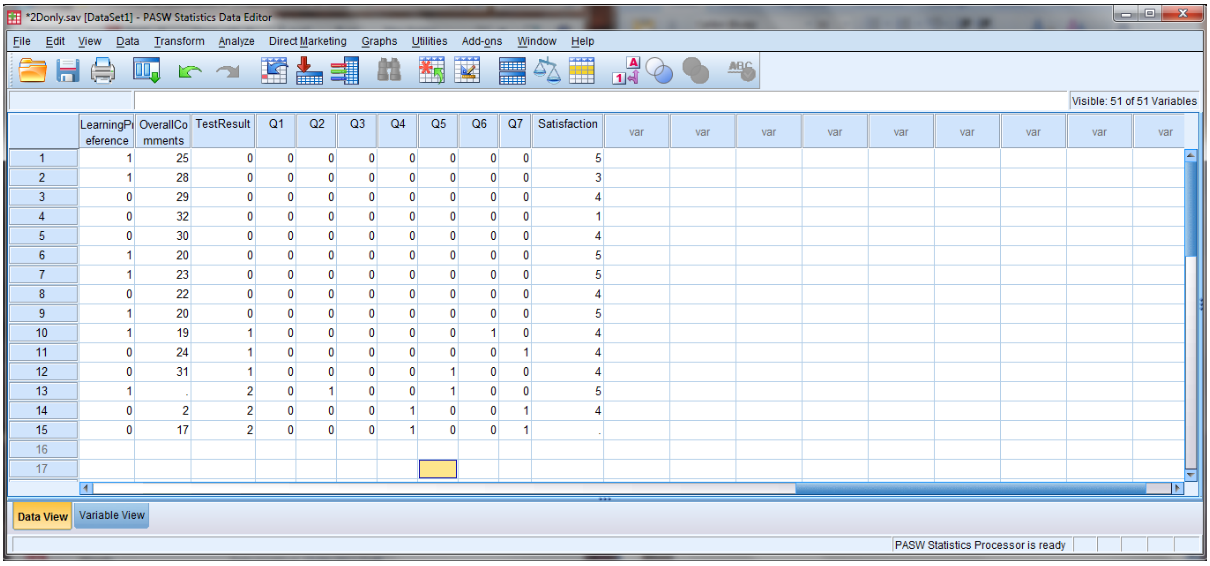
Visible: 51 of 51 Variables

	ObjectiveComment	TutorialEasy	TutorialClear	TutorialLearn	TutorialPresence	TutorialComment	QuizUseful	QuizClear	QuizWaste	QuizPresence	QuizComment	TestUnderstandable	TestClear	TestAmount	TestPresence	TestComment	Interesting	Helpful	Frustrated	Annoyed
1	.	0	0	1	2	.	1	2	5	2	.	0	1	1	2	.	0	0	1	1
2	15	2	2	1	3	17	0	0	4	2	14	2	0	0	3	.	0	0	0	0
3	.	1	1	1	2	.	1	1	3	2	.	1	1	2	3	.	0	0	1	1
4	.	2	1	4	2	.	3	2	3	3	16	1	4	2	3	14	1	1	1	0
5	.	0	1	0	3	.	1	0	5	1	.	0	0	0	3	.	0	0	1	1
6	11	0	0	0	2	.	1	0	4	3	.	0	1	0	4	.	0	0	1	1
7	14	0	0	0	2	14	0	0	0	2	2	0	0	0	3	12	0	0	1	1
8	13	0	1	0	2	14	0	0	5	2	1	0	0	0	2	11	0	0	1	1
9	12	0	0	0	3	13	0	0	5	2	9	0	0	0	2	10	0	0	1	1
10	.	1	1	1	3	15	1	1	1	3	13	1	1	0	2	12	0	0	1	1
11	20	0	0	0	2	.	0	0	5	2	.	0	0	0	2	.	0	0	1	1
12	.	0	0	0	2	.	0	0	5	3	.	0	0	0	3	.	0	0	1	1
13	.	0	0	0	2	.	0	0	5	2	.	0	0	0	3	.	0	0	1	1
14	.	0	0	0	3	.	0	0	5	2	.	0	0	0	2	.	0	0	1	1
15	16	0	0	0	3	16	0	0	5	3	15	0	0	0	1	13	0	0	1	1
16																				

Data View | Variable View

PASW Statistics Processor is ready

Appendix B5.2: The snapshot shows the raw data of 2DC user perception and satisfaction in the second experiment



*2Donly.sav [DataSet1] - PASW Statistics Data Editor

Visible: 51 of 51 Variables

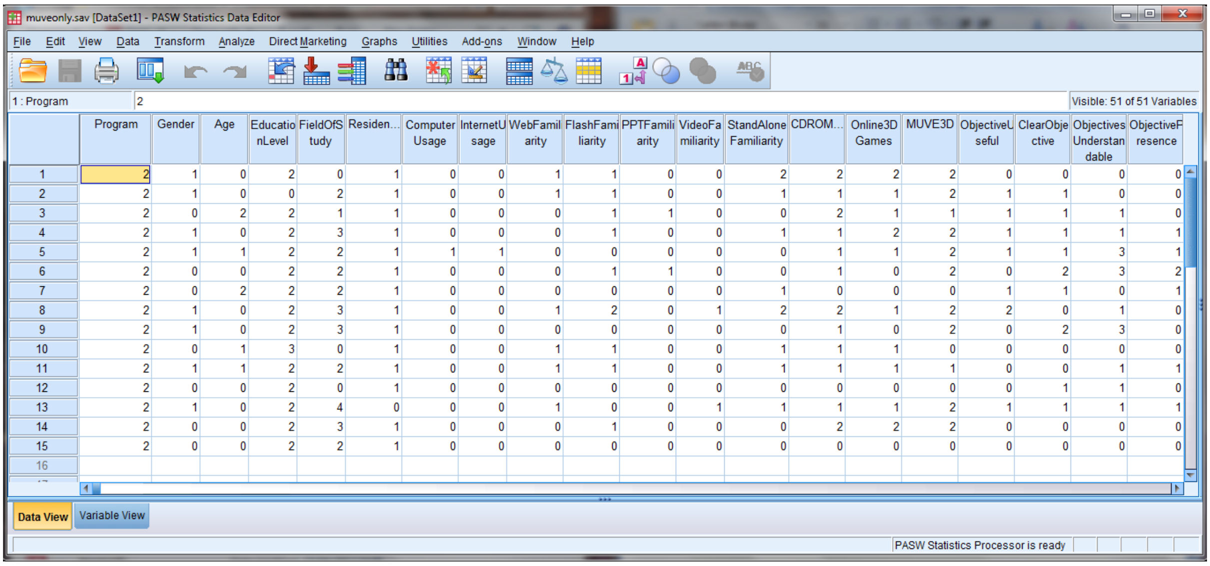
	LearningPreference	OverallComments	TestResult	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Satisfaction	var	var	var	var	var	var	var	var	var
1	1	25	0	0	0	0	0	0	0	0	5									
2	1	28	0	0	0	0	0	0	0	0	3									
3	0	29	0	0	0	0	0	0	0	0	4									
4	0	32	0	0	0	0	0	0	0	0	1									
5	0	30	0	0	0	0	0	0	0	0	4									
6	1	20	0	0	0	0	0	0	0	0	5									
7	1	23	0	0	0	0	0	0	0	0	5									
8	0	22	0	0	0	0	0	0	0	0	4									
9	1	20	0	0	0	0	0	0	0	0	5									
10	1	19	1	0	0	0	0	0	1	0	4									
11	0	24	1	0	0	0	0	0	0	1	4									
12	0	31	1	0	0	0	0	1	0	0	4									
13	1	.	2	0	1	0	0	1	0	0	5									
14	0	2	2	0	0	0	1	0	0	1	4									
15	0	17	2	0	0	0	1	0	0	1	.									
16																				
17																				

Data View | Variable View

PASW Statistics Processor is ready

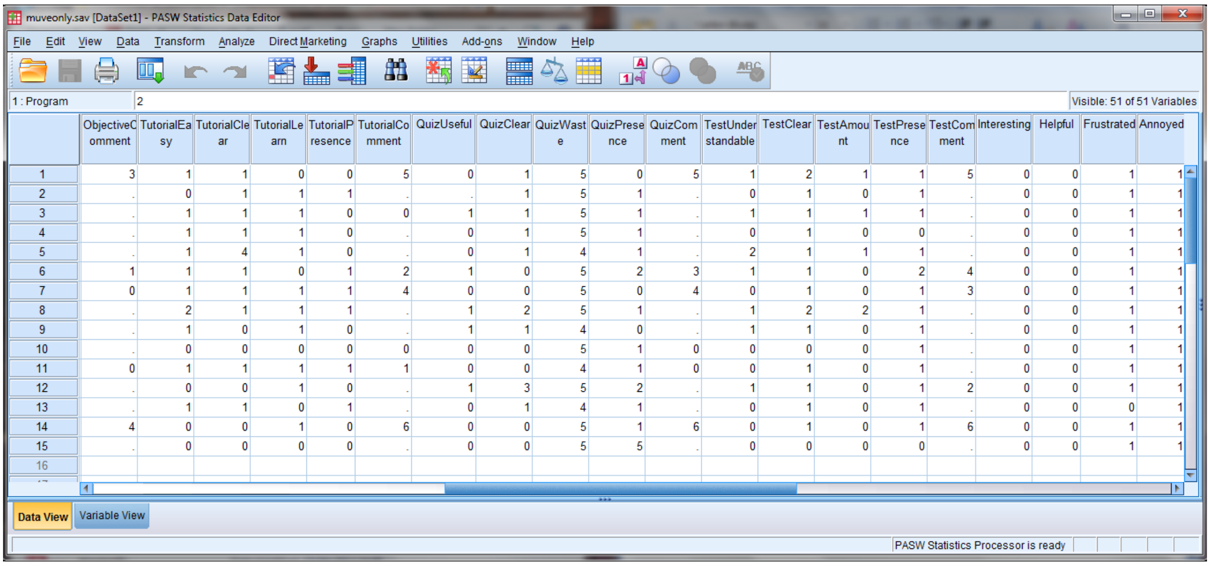
Appendix B5.3: The snapshot shows the 2DC raw data of user performance in the second experiment

VWC2



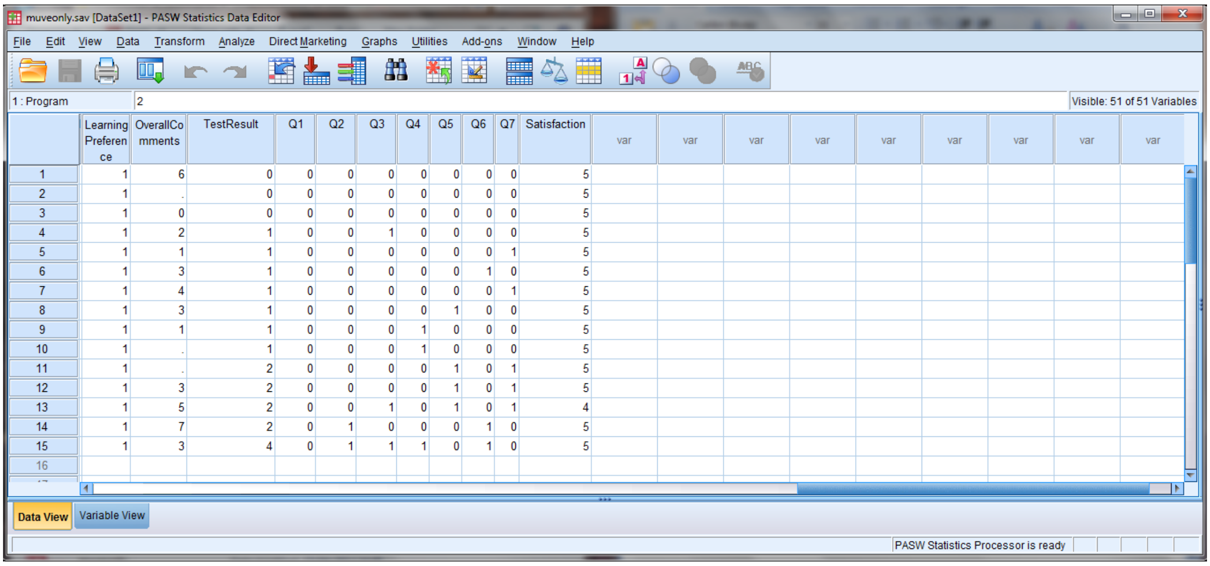
	Program	Gender	Age	EducationLevel	FieldOfStudy	Residen...	ComputerUsage	InternetUsage	WebFamiliarity	FlashFamiliarity	PPTFamiliarity	VideoFamiliarity	StandAloneFamiliarity	CDROM...	Online3DGames	MUVE3D	ObjectiveUseful	ClearObjective	ObjectivesUnderstandable	ObjectivePresence
1	2	1	0	2	0	1	0	0	1	1	0	0	2	2	2	2	0	0	0	0
2	2	1	0	0	2	1	0	0	1	1	0	0	1	1	1	2	1	1	0	0
3	2	0	2	2	1	1	0	0	0	1	1	0	0	2	1	1	1	1	1	0
4	2	1	0	2	3	1	0	0	0	1	0	0	1	1	2	2	1	1	1	1
5	2	1	1	2	2	1	1	1	0	0	0	0	0	1	1	2	1	1	3	1
6	2	0	0	2	2	1	0	0	0	1	1	0	0	1	0	2	0	2	3	2
7	2	0	2	2	2	1	0	0	0	0	0	0	1	0	0	0	1	1	0	1
8	2	1	0	2	3	1	0	0	1	2	0	1	2	2	1	2	2	0	1	0
9	2	1	0	2	3	1	0	0	0	0	0	0	0	1	0	2	0	2	3	0
10	2	0	1	3	0	1	0	0	1	1	0	0	1	1	1	0	0	0	0	0
11	2	1	1	2	2	1	0	0	1	1	0	0	1	1	1	1	0	0	1	1
12	2	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0
13	2	1	0	2	4	0	0	0	1	0	0	1	1	1	1	2	1	1	1	1
14	2	0	0	2	3	1	0	0	0	1	0	0	0	2	2	2	0	0	0	0
15	2	0	0	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16																				

Appendix B5.4: The snapshot shows the raw data of VWC2 user profile in the second experiment



	ObjectiveComment	TutorialEasy	TutorialClear	TutorialLearn	TutorialPresence	TutorialComment	QuizUseful	QuizClear	QuizWaste	QuizPresence	QuizComment	TestUnderstandable	TestClear	TestAmount	TestPresence	TestComment	Interesting	Helpful	Frustrated	Annoyed
1	3	1	1	0	0	5	0	1	5	0	5	1	2	1	1	5	0	0	1	1
2	.	0	1	1	1	.	.	1	5	1	.	0	1	0	1	.	0	0	1	1
3	.	1	1	1	0	0	1	1	5	1	.	1	1	1	1	.	0	0	1	1
4	.	1	1	1	0	.	0	1	5	1	.	0	1	0	0	.	0	0	1	1
5	.	1	4	1	0	.	0	1	4	1	.	2	1	1	1	.	0	0	1	1
6	1	1	1	0	1	2	1	0	5	2	3	1	1	0	2	4	0	0	1	1
7	0	1	1	1	1	4	0	0	5	0	4	0	1	0	1	3	0	0	1	1
8	.	2	1	1	1	.	1	2	5	1	.	1	2	2	1	.	0	0	1	1
9	.	1	0	1	0	.	1	1	4	0	.	1	1	0	1	.	0	0	1	1
10	.	0	0	0	0	0	0	0	5	1	0	0	0	0	1	.	0	0	1	1
11	0	1	1	1	1	1	0	0	4	1	0	0	1	0	1	.	0	0	1	1
12	.	0	0	1	0	.	1	3	5	2	.	1	1	0	1	2	0	0	1	1
13	.	1	1	0	1	.	0	1	4	1	.	0	1	0	1	.	0	0	0	1
14	4	0	0	1	0	6	0	0	5	1	6	0	1	0	1	6	0	0	1	1
15	.	0	0	0	0	.	0	0	5	5	.	0	0	0	0	.	0	0	1	1
16																				

Appendix B5.5: The snapshot shows the raw data of VWC2 user perception and satisfaction in the second experiment



muveonly.sav [DataSet1] - PASW Statistics Data Editor

File Edit View Data Transform Analyze Direct Marketing Graphs Utilities Add-ons Window Help

1 : Program 2 Visible: 51 of 51 Variables

	LearningPreference	OverallComments	TestResult	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Satisfaction	var	var	var	var	var	var	var	var	var
1	1	6	0	0	0	0	0	0	0	0	5									
2	1	.	0	0	0	0	0	0	0	0	5									
3	1	0	0	0	0	0	0	0	0	0	5									
4	1	2	1	0	0	1	0	0	0	0	5									
5	1	1	1	0	0	0	0	0	0	1	5									
6	1	3	1	0	0	0	0	0	1	0	5									
7	1	4	1	0	0	0	0	0	0	1	5									
8	1	3	1	0	0	0	0	1	0	0	5									
9	1	1	1	0	0	0	1	0	0	0	5									
10	1	.	1	0	0	0	1	0	0	0	5									
11	1	.	2	0	0	0	0	1	0	1	5									
12	1	3	2	0	0	0	0	1	0	1	5									
13	1	5	2	0	0	1	0	1	0	1	4									
14	1	7	2	0	1	0	0	0	1	0	5									
15	1	3	4	0	1	1	1	0	1	0	5									
16																				

Data View Variable View

PASW Statistics Processor is ready

Appendix B5.6: The snapshot shows the VWC2 raw data of user performance in the second experiment

Appendices C: The Materials Used in the Third Experiment

(Appendix C1) Questionnaire Used in the Third Experiment

I am pleased to present myself to you as one of postgraduate research students in the School of Informatics at University of Bradford. I am currently developing and investigating the courseware in an online 3D environment or Virtual World (MUVE). I used Second Life as a platform. I would like to obtain your views regarding the:

1- The use of courseware in Virtual World

2- The use of video in Virtual World courseware

Please answer the questions as truthfully as possible. It could be grateful if you could fill in the following questionnaire sincerely and provide your views. Your privacy is maintained as your name would not be mentioned in any part of the study.

NSH Nik Ahmad

Guidelines:

Before start learning:
Please follow the following procedure:

1. Please download **Second Life** program on your computer by following this link. *http://secondlife.com/support/downloads/['*
2. Log in with any of the username and password provided below. (Choose either one)

Username1: buaya
Password1: tembaga

Username2: bidadari
Password2: syurga

Username3: emak
Password3: abdulaziz

Username4: ustaz
Password4: khairulazan

Username5: gadis
Password5: syurga

Username6: muhd
Password6: leader

Username7: perawan
Password7: syurga

During Learning (after log in)
1. Understand the **objective** given at the beginning of the learning.
2. Go through the **tutorial and practical room** to learn the cupping techniques.
3. Answer the **quiz** to train your memory and understanding.
4. Answer the **test** at the end of the learning.

After learning session
1. Please answer the satisfaction **questionnaire** after completing the learning by following this link.

Section A: Demography

1. Gender: ☐ Male ☐ Female

2. Age: ☐ 18-24 years ☐ 35-44 years

☐ 25-34 years ☐ 45-54 years

☐ 55+

3. Education level:

☐ High School ☐ College ☐ Doctorate

☐ Undergraduate ☐ Master ☐ Other

4. Area of study: ______________________________

5. Residence:

☐ Home ☐ Oversea

Section B: Computer and internet application usage and familiarity.

6. How often do you use the computer per week?

☐ More than 10 hours ☐ 6-10 hours

☐ 1-5 hours ☐ Less than 1 hour

☐ Never

7. How often do you used the internet per week?

☐ More than 10 hours ☐ 6-10 hours

☐ 1-5 hours ☐ Less than 1 hour

☐ Never

8. Familiarity with 2D computer learning application:

	Not Familiar	Slight-Average	Familiar
Web	☐	☐	☐
Flash (Animation)	☐	☐	☐
Presentation Tool (e.g.: Power Point)	☐	☐	☐
Video (eg: Youtube)	☐	☐	☐
Stand-alone courseware (e.g.: CD-ROM or kiosk)	☐	☐	☐

9. Familiarity with 3D computer learning application:

Stand-alone-Games (3D)	☐	☐	☐
Online 3D Games	☐	☐	☐

3D MUVE ☐ ☐ ☐

(multi-user virtual environment)

e.g.: Second Life, River City, etc)

Section C: Program satisfaction.

For each statement below, please express your view by placing a tick in appropriate column.

VW

Statements		Agreement			Disagreement		
		Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree
Objective (Reception)							
10	The objective given at the beginning is useful in giving overall mission to be achieved at the end of the learning session.						
11	The features given in objective section are clear.						
12	The objective and picture given is easy to understand.						
13	I feel like standing in the real reception room.						
14	Please give any comments or suggestion towards tutorial and objective or reception room session.	______________________________ ______________________________					
Tutorial and Training							
15	The 3D objects and environment are easy to						

	understand.						
16	The environment and 3D objects given are clear.						
17	The amount of 3D objects and environment are just nice to explore with.						
18	I feel like standing in the real tutorial and training room.						
19	Please give any comments or suggestion towards tutorial and training room session.	______________________________					
Quiz							
20	The quizzes given are useful to train my understanding and memory.						
21	The features given in the quiz room are clear.						
22	The quizzes given are wasting my time.						
23	I feel like standing in the real quiz room.						
24	Please give any comments or suggestion towards quiz room and session.	______________________________					
Test							
25	The test is useful to train my understanding.						
26	The 3D objects and instruction given in the test						

	room are clear.						
27	It amount of test questions are just nice.						
28	I feel like standing in the real test room.						
29	Please give any comments or suggestion towards test room and session.	______________________________					

Video

Statements		Agreement			Disagreement		
		Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree
Usability							
30	The video program added is useful.						
31	The video program is interesting.						
32	The video movement is smooth.						
33	The subtitle is clear.						
34	The sound in a video program is clear.						
Aesthetic (User interface)							
35	The video frame and gadget is interesting.						
36	The picture of the video is clear.						
37	The video program need to be designed more sophisticated.						
Efficacy							
38	The video program makes my understanding better.						
39	The video program wasting my time.						
40	The video program is stressful.						
41	The video program is not helpful.						
42	There is a necessity of adding video program.						

Section D: Overall views and recommendations

(can (/) more than one)

43. How did you find the learning through Virtual World (3D online environment)?

	Yes	No
Focused and interesting	☐	☐
Helpful	☐	☐
Frustrated	☐	☐
Annoyed and boring	☐	☐

44. How did you find the video of cupping techniques added in tutorial site?

	Yes	No
Focused and interesting	☐	☐
Helpful	☐	☐
Frustrated	☐	☐
Annoyed and boring	☐	☐

45. What is your preferred learning interface?

☐ 2D interface (web/ flash/ etc)

☐ 3D online environment experience learning (MUVE/Games/ Virtual World)

46. What is your overall comment or suggestion?

____

____

____

(Thanks for your corporation, and your participation is highly appreciated.)

(Appendix C2) The Snapshots of Video Segment in the Tutorial Section

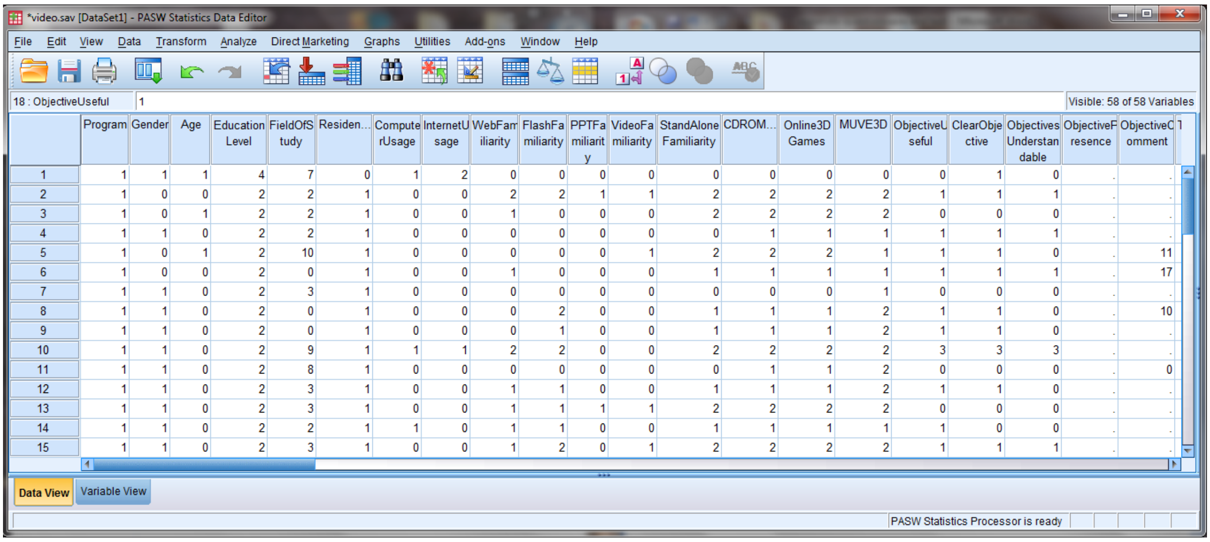
Appendix C2.1: The snapshot shows the video segment presentation in Second Life

Appendix C2.2: The snapshot shows the first video tutorial

Appendix C2.3: The snapshot shows the second video tutorial

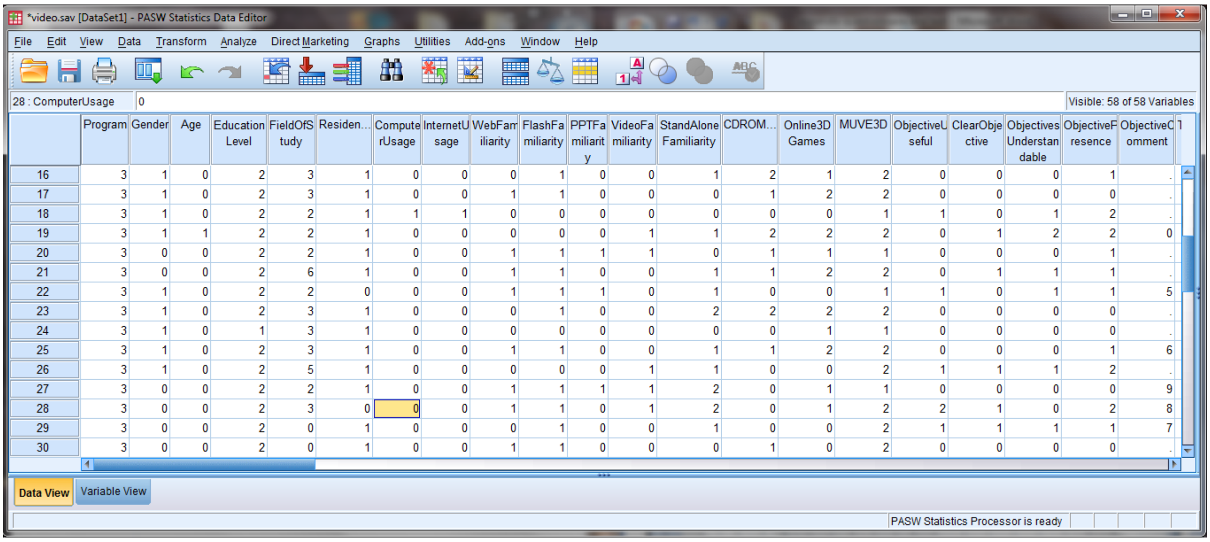
Appendix C2.4: The snapshot shows the third video tutorial

(Appendix C3) The Raw Data of the Third Experiment



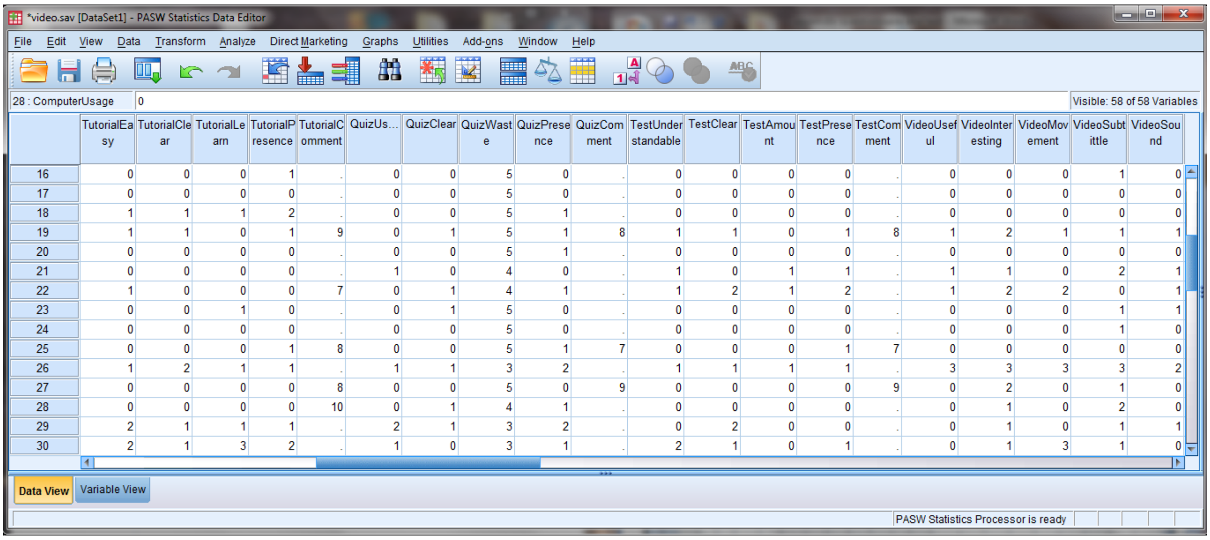
	Program	Gender	Age	Education Level	FieldOfStudy	Residen...	ComputerUsage	InternetUsage	WebFamiliarity	FlashFamiliarity	PPTFamiliarity	VideoFamiliarity	StandAlone Familiarity	CDROM...	Online3D Games	MUVE3D	ObjectiveUseful	ClearObjective	Objectives Understandable	ObjectivePresence	ObjectiveComment
1	1	1	1	4	7	0	1	2	0	0	0	0	0	0	0	0	0	1	0	.	.
2	1	0	0	2	2	1	0	0	2	2	1	1	2	2	2	2	1	1	1	.	.
3	1	0	1	2	2	1	0	0	1	0	0	0	2	2	2	2	0	0	0	.	.
4	1	1	0	2	2	1	0	0	0	0	0	0	0	1	1	1	1	1	1	.	.
5	1	0	1	2	10	1	0	0	0	0	0	1	2	2	2	1	1	1	0	.	11
6	1	0	0	2	0	1	0	0	1	0	0	0	1	1	1	1	1	1	1	.	17
7	1	1	0	2	3	1	0	0	0	0	0	0	0	0	0	1	0	0	0	.	.
8	1	1	0	2	0	1	0	0	0	2	0	0	1	1	1	2	1	1	0	.	10
9	1	1	0	2	0	1	0	0	0	1	0	0	1	1	1	2	1	1	0	.	.
10	1	1	0	2	9	1	1	1	2	2	0	0	2	2	2	2	3	3	3	.	.
11	1	1	0	2	8	1	0	0	0	0	0	0	0	1	1	2	0	0	0	.	0
12	1	1	0	2	3	1	0	0	1	1	0	0	1	1	1	2	1	1	0	.	.
13	1	1	0	2	3	1	0	0	1	1	1	1	2	2	2	2	0	0	0	.	.
14	1	1	0	2	2	1	1	0	1	1	0	0	1	1	1	1	1	0	0	.	.
15	1	1	0	2	3	1	0	0	1	2	0	1	2	2	2	2	1	1	1	.	.

Appendix C3.1: The snapshot shows the raw data of user profile (1-15) in the third experiment



	Program	Gender	Age	Education Level	FieldOfStudy	Residen...	ComputerUsage	InternetUsage	WebFamiliarity	FlashFamiliarity	PPTFamiliarity	VideoFamiliarity	StandAlone Familiarity	CDROM...	Online3D Games	MUVE3D	ObjectiveUseful	ClearObjective	Objectives Understandable	ObjectivePresence	ObjectiveComment
16	3	1	0	2	3	1	0	0	0	1	0	0	1	2	1	2	0	0	0	1	.
17	3	1	0	2	3	1	0	0	1	1	0	0	0	1	2	2	0	0	0	0	.
18	3	1	0	2	2	1	1	1	0	0	0	0	0	0	0	1	1	0	1	2	.
19	3	1	1	2	2	1	0	0	0	0	0	1	1	2	2	2	0	1	2	2	0
20	3	0	0	2	2	1	0	0	1	1	1	1	0	1	1	1	0	0	0	1	.
21	3	0	0	2	6	1	0	0	1	1	0	0	1	1	2	2	0	1	1	1	.
22	3	1	0	2	2	0	0	0	1	1	1	0	1	0	0	1	1	0	1	1	5
23	3	1	0	2	3	1	0	0	0	1	0	0	2	2	2	2	0	0	0	0	.
24	3	1	0	1	3	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	.
25	3	1	0	2	3	1	0	0	1	1	0	0	1	1	2	2	0	0	0	1	6
26	3	1	0	2	5	1	0	0	0	0	0	1	1	0	0	2	1	1	1	2	.
27	3	0	0	2	2	1	0	0	1	1	1	1	2	0	1	1	0	0	0	0	9
28	3	0	0	2	3	0	0	0	1	1	0	1	2	0	1	2	2	1	0	2	8
29	3	0	0	2	0	1	0	0	0	1	0	0	1	0	0	2	1	1	1	1	7
30	3	0	0	2	0	1	0	0	1	1	0	0	0	1	0	2	0	0	0	0	.

Appendix C3.2: The snapshot shows the raw data of user profile (16-30) in the third experiment



*video.sav [DataSet1] - PASW Statistics Data Editor

File Edit View Data Transform Analyze Direct Marketing Graphs Utilities Add-ons Window Help

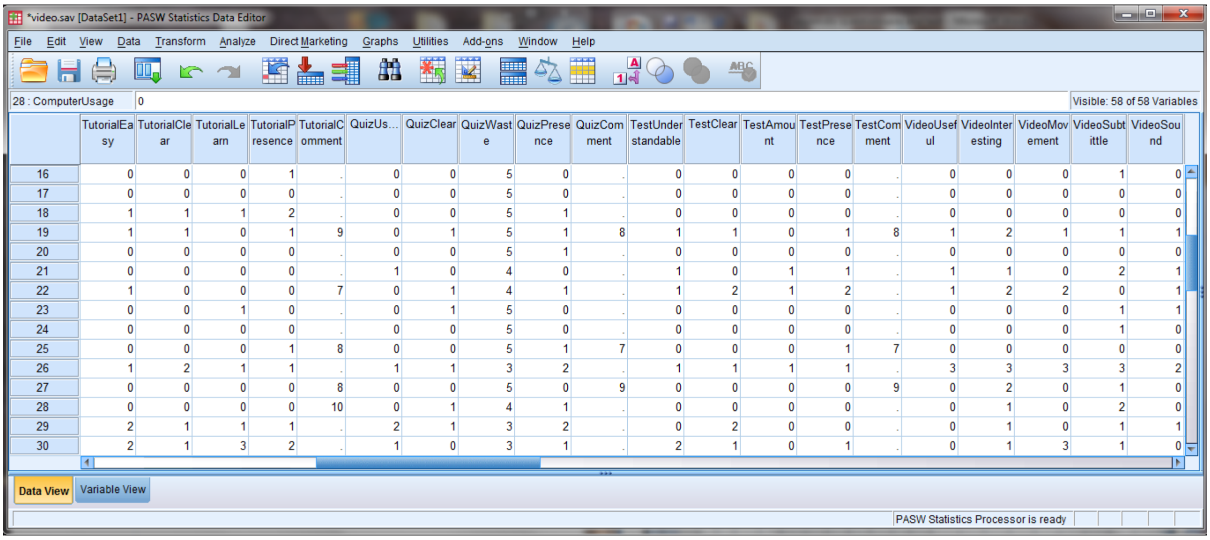
28 : ComputerUsage 0 — Visible: 58 of 58 Variables

	TutorialEasy	TutorialClear	TutorialLearn	TutorialPresence	TutorialComment	QuizUs...	QuizClear	QuizWaste	QuizPresence	QuizComment	TestUnderstandable	TestClear	TestAmount	TestPresence	TestComment	VideoUseful	VideoInteresting	VideoMovement	VideoSubtittle	VideoSound
16	0	0	0	1	.	0	0	5	0	.	0	0	0	0	.	0	0	0	1	0
17	0	0	0	0	.	0	0	5	0	.	0	0	0	0	.	0	0	0	0	0
18	1	1	1	2	.	0	0	5	1	.	0	0	0	0	.	0	0	0	0	0
19	1	1	0	1	9	0	1	5	1	8	1	1	0	1	8	1	2	1	1	1
20	0	0	0	0	.	0	0	5	1	.	0	0	0	0	.	0	0	0	0	0
21	0	0	0	0	.	1	0	4	0	.	1	0	1	1	.	1	1	0	2	1
22	1	0	0	0	7	0	1	4	1	.	1	2	1	2	.	1	2	2	0	1
23	0	0	1	0	.	0	1	5	0	.	0	0	0	0	.	0	0	0	1	1
24	0	0	0	0	.	0	0	5	0	.	0	0	0	0	.	0	0	0	1	0
25	0	0	0	1	8	0	0	5	1	7	0	0	0	1	7	0	0	0	0	0
26	1	2	1	1	.	1	1	3	2	.	1	1	1	1	.	3	3	3	3	2
27	0	0	0	0	8	0	0	5	0	9	0	0	0	0	9	0	2	0	1	0
28	0	0	0	0	10	0	1	4	1	.	0	0	0	0	.	0	1	0	2	0
29	2	1	1	1	.	2	1	3	2	.	0	2	0	0	.	0	1	0	1	1
30	2	1	3	2	.	1	0	3	1	.	2	1	0	1	.	0	1	3	1	0

Data View | Variable View

PASW Statistics Processor is ready

Appendix C3.3: The snapshot shows the raw data of user experience (1-15) in the third experiment



*video.sav [DataSet1] - PASW Statistics Data Editor

File Edit View Data Transform Analyze Direct Marketing Graphs Utilities Add-ons Window Help

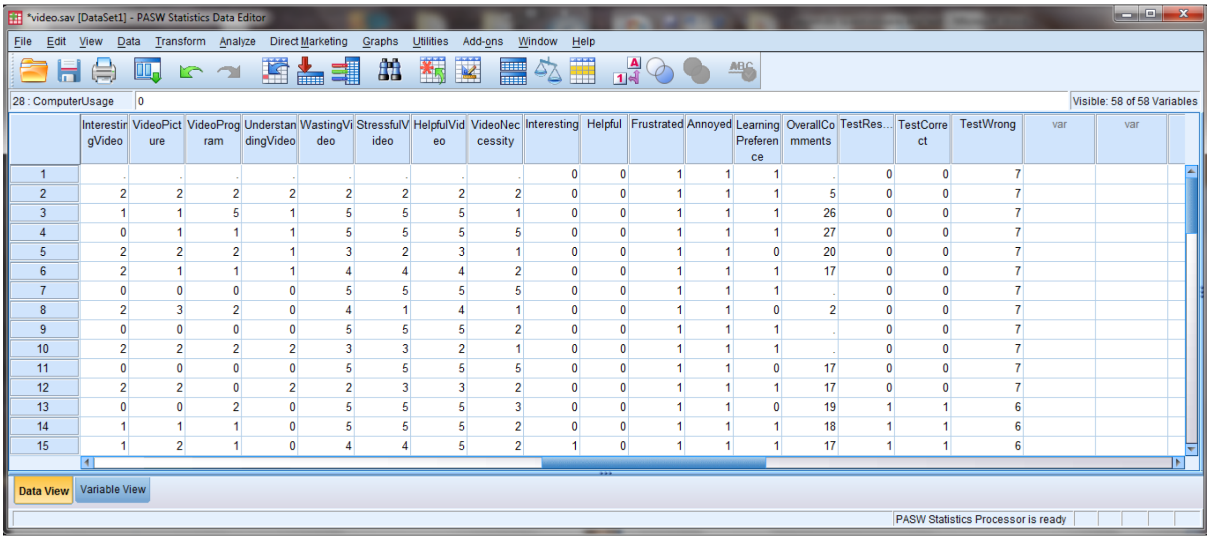
28 : ComputerUsage 0 — Visible: 58 of 58 Variables

	TutorialEasy	TutorialClear	TutorialLearn	TutorialPresence	TutorialComment	QuizUs...	QuizClear	QuizWaste	QuizPresence	QuizComment	TestUnderstandable	TestClear	TestAmount	TestPresence	TestComment	VideoUseful	VideoInteresting	VideoMovement	VideoSubtittle	VideoSound
16	0	0	0	1	.	0	0	5	0	.	0	0	0	0	.	0	0	0	1	0
17	0	0	0	0	.	0	0	5	0	.	0	0	0	0	.	0	0	0	0	0
18	1	1	1	2	.	0	0	5	1	.	0	0	0	0	.	0	0	0	0	0
19	1	1	0	1	9	0	1	5	1	8	1	1	0	1	8	1	2	1	1	1
20	0	0	0	0	.	0	0	5	1	.	0	0	0	0	.	0	0	0	0	0
21	0	0	0	0	.	1	0	4	0	.	1	0	1	1	.	1	1	0	2	1
22	1	0	0	0	7	0	1	4	1	.	1	2	1	2	.	1	2	2	0	1
23	0	0	1	0	.	0	1	5	0	.	0	0	0	0	.	0	0	0	1	1
24	0	0	0	0	.	0	0	5	0	.	0	0	0	0	.	0	0	0	1	0
25	0	0	0	1	8	0	0	5	1	7	0	0	0	1	7	0	0	0	0	0
26	1	2	1	1	.	1	1	3	2	.	1	1	1	1	.	3	3	3	3	2
27	0	0	0	0	8	0	0	5	0	9	0	0	0	0	9	0	2	0	1	0
28	0	0	0	0	10	0	1	4	1	.	0	0	0	0	.	0	1	0	2	0
29	2	1	1	1	.	2	1	3	2	.	0	2	0	0	.	0	1	0	1	1
30	2	1	3	2	.	1	0	3	1	.	2	1	0	1	.	0	1	3	1	0

Data View | Variable View

PASW Statistics Processor is ready

Appendix C3.4: The snapshot shows the raw data of user experience (16-30) in the third experiment



*video.sav [DataSet1] - PASW Statistics Data Editor

File Edit View Data Transform Analyze Direct Marketing Graphs Utilities Add-ons Window Help

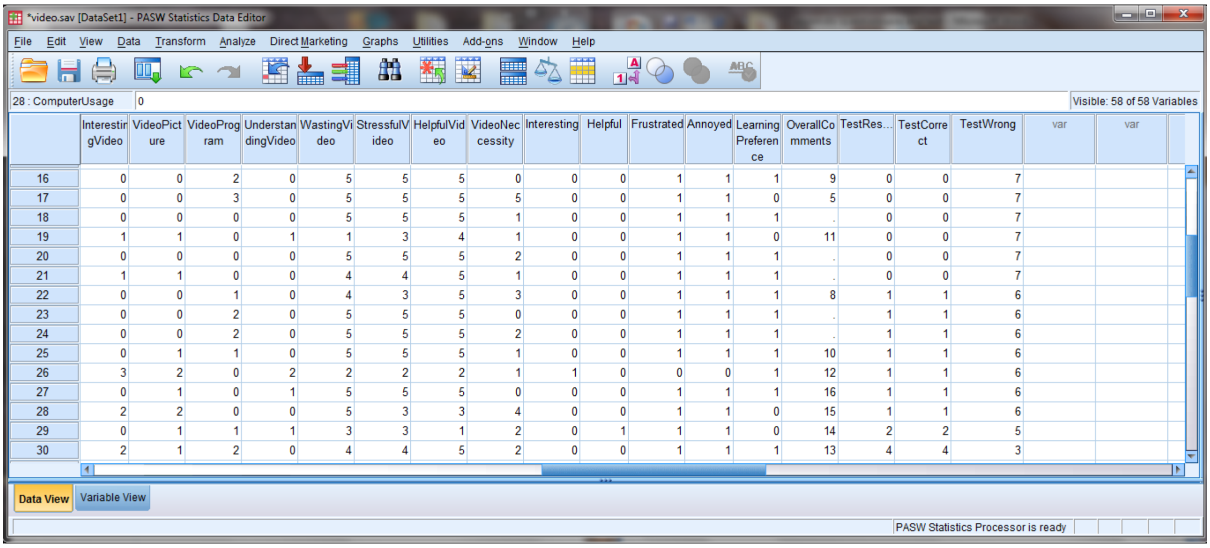
28 : ComputerUsage | 0 | Visible: 58 of 58 Variables

	InterestingVideo	VideoPicture	VideoProgram	UnderstandingVideo	WastingVideo	StressfulVideo	HelpfulVideo	VideoNecessity	Interesting	Helpful	Frustrated	Annoyed	LearningPreference	OverallComments	TestRes...	TestCorrect	TestWrong	var	var
1	.	.	.	.	.	.	.	.	0	0	1	1	1	.	0	0	7		
2	2	2	2	2	2	2	2	2	0	0	1	1	1	5	0	0	7		
3	1	1	5	1	5	5	5	1	0	0	1	1	1	26	0	0	7		
4	0	1	1	1	5	5	5	5	0	0	1	1	1	27	0	0	7		
5	2	2	2	1	3	2	3	1	0	0	1	1	0	20	0	0	7		
6	2	1	1	1	4	4	4	2	0	0	1	1	1	17	0	0	7		
7	0	0	0	0	5	5	5	5	0	0	1	1	1	.	0	0	7		
8	2	3	2	0	4	1	4	1	0	0	1	1	0	2	0	0	7		
9	0	0	0	0	5	5	5	2	0	0	1	1	1	.	0	0	7		
10	2	2	2	2	3	3	2	1	0	0	1	1	1	.	0	0	7		
11	0	0	0	0	5	5	5	5	0	0	1	1	0	17	0	0	7		
12	2	2	0	2	2	3	3	2	0	0	1	1	1	17	0	0	7		
13	0	0	2	0	5	5	5	3	0	0	1	1	0	19	1	1	6		
14	1	1	1	0	5	5	5	2	0	0	1	1	1	18	1	1	6		
15	1	2	1	0	4	4	5	2	1	0	1	1	1	17	1	1	6		

Data View | Variable View

PASW Statistics Processor is ready

Appendix C3.5: The snapshot shows the raw data of user perception, satisfaction and performance (1-15) in the third experiment



*video.sav [DataSet1] - PASW Statistics Data Editor

File Edit View Data Transform Analyze Direct Marketing Graphs Utilities Add-ons Window Help

28 : ComputerUsage | 0 | Visible: 58 of 58 Variables

	InterestingVideo	VideoPicture	VideoProgram	UnderstandingVideo	WastingVideo	StressfulVideo	HelpfulVideo	VideoNecessity	Interesting	Helpful	Frustrated	Annoyed	LearningPreference	OverallComments	TestRes...	TestCorrect	TestWrong	var	var
16	0	0	2	0	5	5	5	0	0	0	1	1	1	9	0	0	7		
17	0	0	3	0	5	5	5	5	0	0	1	1	0	5	0	0	7		
18	0	0	0	0	5	5	5	1	0	0	1	1	1	.	0	0	7		
19	1	1	0	1	1	3	4	1	0	0	1	1	0	11	0	0	7		
20	0	0	0	0	5	5	5	2	0	0	1	1	1	.	0	0	7		
21	1	1	0	0	4	4	5	1	0	0	1	1	1	.	0	0	7		
22	0	0	1	0	4	3	5	3	0	0	1	1	1	8	1	1	6		
23	0	0	2	0	5	5	5	0	0	0	1	1	1	.	1	1	6		
24	0	0	2	0	5	5	5	2	0	0	1	1	1	.	1	1	6		
25	0	1	1	0	5	5	5	1	0	0	1	1	1	10	1	1	6		
26	3	2	0	2	2	2	2	1	1	0	0	0	1	12	1	1	6		
27	0	1	0	1	5	5	5	0	0	0	1	1	1	16	1	1	6		
28	2	2	0	0	5	3	3	4	0	0	1	1	0	15	1	1	6		
29	0	1	1	1	3	3	1	2	0	1	1	1	0	14	2	2	5		
30	2	1	2	0	4	4	5	2	0	0	1	1	1	13	4	4	3		

Data View | Variable View

PASW Statistics Processor is ready

Appendix C3.6: The snapshot shows the raw data of user perception, satisfaction and performance (16-30) in the third experiment